Part A – Gas Entry Conditions in respect of the NTS System Entry Point

1. Connected Delivery Facility and Individual System Entry Point(s)

1.1 The Connected Delivery Facility is the Delivery Facility as defined in this Agreement.

1.2 The Individual System Entry Point(s) comprised in the System Entry Point are shown in the drawing attached as Attachment A to Schedule 1

2. Gas Entry Conditions

2.1 These Gas Entry Conditions shall apply at the System Entry Point.

2.2 Gas tendered for delivery by System Users to the System at the System Entry Point shall comply with the System's statutory safety requirements, including any Legal Requirement regarding the composition of gas to be conveyed in the System (including without limitation, schedule 3 of the Gas Safety (Management) Regulations 1996).

2.3 Gas tendered for delivery by System Users to the System at the System Entry Point shall not contain any solid, liquid or gaseous material which would interfere with the integrity or operation of the System or any pipeline connected to such System or any appliance which a consumer might reasonably be expected to have connected to the System. In addition, all gas delivered to the System at the System Entry Point shall be in accordance with the following values:

(a)	Hydrogen Sulphide	not more than 5 mg/SCM.
(b)	Total Sulphur	not more than 50 mg/SCM.
(c)	Hydrogen Content	not more than 0.1 mol%.
(d)	Oxygen Content	not more than 0.001 mol%.
(e)	Hydrocarbon Dewpoint	not more than minus two degrees Celsius (-2°C) at any pressure up to seventy bar gauge (70 barg).
(f)	Water Content	not such as would cause a water dewpoint more than minus ten degrees Celsius (-10ºC) at eighty five bar gauge (85 barg) or the actual delivery pressure.
(g)	Wobbe Number	shall be between 47.2 MJ/SCM, and 51.41 MJ/SCM.
(h)	Incomplete Combustion Factor (ICF)	not more than 0.48.
(i)	Soot Index (SI)	not more than 0.60.
(j)	Odour	it shall have no odour that may cause Transco to fail to meet its obligation under Part 1 of Schedule 3 of the Gas Safety (Management) Regulations 1996.
(k)	Carbon Dioxide	not more than 2.0 mol%.
(l)	Nitrogen	not more than 7.0 mol%.
(m)	Total Inerts	not more than 7.0 mol%.
(n)	Gross Calorific Value	shall be within the range 36.9 to 42.3 MJ/SCM. (real gross dry);

(o) Delivery Temperature — shall be between one and thirty eight degrees Celsius (1°C and 38°C).

(p) Pressure — shall be that required to deliver gas into the System taking account of the back pressure as the same shall vary from time to time. The delivery pressure shall not exceed seventy bar gauge (70 barg).

Incomplete combustion factor (ICF) and Soot Index (SI) have meanings as defined in Part 1 of Schedule 3 of the Gas Safety (Management) Regulations 1996.

2.4 Pursuant to the provisions of the Gas Safety (Management) Regulations 1996 (the "Regulations"), the National Emergency Co-ordinator may, where it is necessary to prevent a supply emergency, authorise (for a specified period) gas not conforming with the requirements specified in Part I of Schedule 3 to the Regulations to be conveyed in the System if the gas conforms with the requirements specified in Part II of Schedule 3 to the Regulations. In the event that the National Emergency Co-ordinator does so authorise gas not conforming with the requirements specified in Part I of Schedule 3 to the Regulations to be conveyed in the System from the System Entry Point, the requirements in relation to Wobbe Number and incomplete Combustion Factor (ICF) set out in paragraph 2.3 above shall be amended as set out below for the period specified by the National Emergency Co-ordinator:-

(a) Wobbe Number shall be between 46.5 MJ/SCM, and 52.85 MJ/SCM.

(b) Incomplete Combustion Factor (ICF) shall be not more than 1.49.

2.5 In order to meet the calibration ranges for typical analysis equipment, unless agreed otherwise by the Parties, the concentration ranges of the following components in the gas delivered shall be as follows:

Component	**% mole low**	**% mole high**
Methane	78.00	98.00
Ethane	0.00	12.00
Propane	0.00	7.00
i-Butane	0.00	1.00
n-Butane	0.00	1.00
neo-Pentane	0.00	0.35
i-Pentane	0.00	0.35
n-Pentane	0.00	0.35
C6+ fraction	0.00	0.35

The Parties acknowledge that Transco may require the approval of Ofgem prior to being able to agree to any change to the concentration ranges referred to above, and Transco will act reasonably in seeking approval from Ofgem in an expedient manner, but Transco confirms that it will not otherwise unreasonably withhold or delay its agreement to any such change. Where Transco does so require the approval of Ofgem, the Parties acknowledge

that Transco cannot agree to any change to the concentration ranges referred to above until such time as Transco has received approval from Ofgem.

3. Measurement Provisions

3.1 The Measurement Provisions shall be as set out in Schedule 4.

4. Points of Delivery

4.1 The points of delivery at the System Entry Point shall be those illustrated in the diagram contained in Attachment A to Schedule 1.

5. Additional Requirements

5.1 The DFO shall maintain, repair and operate the Delivery Facility to the standard of a Reasonable and Prudent Operator, and Transco shall maintain, repair and operate the Entry Facility to the standard of a Reasonable and Prudent Operator. In the event that either Party believes that the other Party is not complying with its obligations set out above, then (without prejudice to any rights the first Party may have under any Delivery Arrangement or Transportation Arrangement) it shall notify the other Party accordingly. Following the giving of such notice, the Parties shall meet as soon as reasonably practicable to discuss the matter in good faith.

Part B - Measurement Provisions in respect of the NTS System Entry Point

1. Measurement Equipment

1.1 The Measurement Provisions shall be as set out in this Schedule 4. The provisions of this Schedule 4 as to the measurement of flow (and determination of volume and energy) and the determination of gas quality, including calorific value of gas, delivered to the System shall apply to the System Entry Point.

2. Installation, Commissioning, Operation and Maintenance of the Measurement Equipment comprised within the Connected Delivery Facility:

2.1 This Schedule 4 specifies the metering, sampling, analysis and other equipment (the "Measurement Equipment") at the System Entry Point. The Measurement Equipment shall be installed and maintained to meet the requirements of the Gas (Meters) Regulations 1983, the Gas Safety (Management) Regulations 1996, the Gas Act 1986 and the Gas (Calculation of Thermal Energy) Regulations 1996 (as appropriate).

2.2 General Requirements:

(a) The Measurement Equipment at the Delivery Facility must comply with standards that allow for the determination of the gas quality parameters as stated within the Gas Entry Conditions.

(b) The Measurement Equipment must also determine the volume and energy of all gas transferred between the System and the Delivery Facility under the relevant contractual and regulatory obligations, where applicable. The requirements for these determinations that must be met or exceeded are set out within these Measurement Provisions.

(c) The Measurement Equipment shall be validated prior to any gas flow being allowed to or from the System.

2.3 Gas Quality

(a) The DFO shall install, commission, operate and maintain equipment to determine the characteristics defined in the Gas Entry Conditions of any gas that is passed from the Delivery Facility to the System. Such equipment shall meet the following criteria:

(b) All measurement biases shall as far as is practicable be eliminated or compensated for;

(c) The uncertainty of measurement shall be such that the risk of the DFO and Transco flowing gas that they are both unaware is outwith Schedule 3 of the Gas Safety (Management) Regulations 1996 is minimised. The uncertainties shall be better than those in the specified ranges;

(d) The sampling system used to obtain the sample of gas for quality measurements shall ensure that the sample is representative of the gas passed between the System and the Delivery Facility and that no change to the gas composition occurs between the sample point and the analytical instrument; and

(e) Measurements and validation of equipment to make such measurement shall, where feasible, be traceable to national or international standards.

2.4 Energy and Volume

The DFO shall install, commission, operate and maintain flow measurement equipment to determine instantaneous and integrated volume and energy flows out of the Delivery Facility such that:

(a) All volume and energy flows to the System shall comply with this paragraph;

(b) All volumes shall be corrected to metric Standard Temperature and Standard Pressure conditions, and reported as cubic metres of gas;

(c) The measurement of volume shall be without bias and with an uncertainty of better than plus or minus 1.0% of reading over the specified flow range; and

(d) The uncertainty of the energy flow must be better than ±1.1% of reading over the specified flow range.

2.5 Volume and Energy Calculation

(a) Volume flowrate shall be calculated in accordance with the appropriate standard using a dedicated flow computer that shall accept all signals necessary for the calculation of the total station volume and energy flowrate.

(b) The live input signals from each orifice plate metering stream shall include but not be limited to:

(i) differential pressure transmitter low range;

(ii) differential pressure transmitter high range;

(iii) pressure transmitter;

(iv) temperature transmitter;

(v) line density (if a chromatograph is not installed);

(vi) relative density (if a chromatograph is not installed); and

(vii) gas composition (if a chromatograph is installed).

(c) The live input signals from each turbine metering stream shall include but not be limited to:

(i) turbine meter pulses;

(ii) pressure transmitter;

(iii) temperature transmitter;

(iv) line density (if a chromatograph is not installed);

(v) relative density (if a chromatograph is not installed); and

(vi) gas composition (if a chromatograph is installed).

(d) The live input signals from each ultrasonic metering stream shall include but not be limited to:

(i) ultrasonic meter pulses (or ultrasonic meter parameters via serial link);

(ii) pressure transmitter;

(iii) temperature transmitter;

(iv) line density (if a chromatograph is not installed);

(v) relative density (if a chromatograph is not installed); and

(vi) gas composition (if a chromatograph is installed).

(e) The flow computer shall accept the results of a calibration carried out at a suitably accredited facility to minimise the error of measurement. For turbine and ultrasonic meter calibrations, the number of calibration points that can be entered shall not be less than five.

2.6 Volume Measurement

(a) The flow Measurement Equipment shall be designed, built and installed to BS EN 1776. Further guidance is given in the Institute of Gas Engineers' reports IGE/GM/1 and IGE/GM/4. In addition, the following standards/guidelines shall also apply:

(i) For orifice plate metering systems, BS EN ISO 5167;

(ii) For turbine metering systems, BS 7834 (ISO 9951);

(iii) For ultrasonic metering systems, BS 7965, BS ISO/TR 12765, AGA 9;and

(iv) For any other metering system, such standards/guidelines as may be agreed by Transco.

(b) The uncertainty of the Measurement Equipment must be assessed in accordance with ISO5168 and the relevant parts of ISO5167, ISO9951 and BS 7965 as may be applicable (or such other standards as may be agreed between the Parties).

(c) The calculation of density for the purpose of calculating volume flow and for correction to standard conditions shall be such that:

(i) All densities shall be determined as kilograms per standard cubic metre (kg/SCM);

(ii) The line density shall be calculated from a gas composition obtained via a gas chromatograph. The calculation of line density will be in accordance with the latest version of the ISO 12213 using a live pressure and temperature; and

(iii) The reference density shall be determined using a gas composition obtained via a gas chromatograph. The calculation of reference density will be in accordance with the latest version of the ISO 12213 using Standard Pressure and Standard Temperature.

(d) The measurement of temperature for the purpose of calculating volume flow and for correction to standard conditions shall be such that:

(i) Temperatures shall be determined as degrees Celsius (°C); and

(ii) The requirements of the relevant parts of ISO5167, ISO9951 and BS 7965 as may be applicable (or such other standards as may be agreed between the Parties) are met.

(e) The measurement of pressure for the purpose of calculating volume flow and for correction to standard conditions shall be such that:

(i) Pressure shall be determined as bar gauge; and

(ii) The requirements of the relevant parts of ISO5167, ISO9951 and BS 7965 as may be applicable (or such other standards as may be agreed between the Parties) are met.

2.7 CV Measurement

(a) The DFO shall install, commission, operate and maintain calorific value measurement equipment that operates by chromatography and other means such that:

(i) All calorific values shall be corrected to Standard Temperature and Standard Pressure, and reported as Megajoules per cubic metre (MJ/SCM); and

(ii) The equipment shall read without bias and the uncertainty of the calorific value must be better than plus or minus 0.1% of reading over the specified calorific value range. The determination of uncertainty shall be traceable to national or international standards as appropriate.

(b) The design and operation of the Measurement Equipment shall follow all relevant national or international standards, specifically:

(i) Where the calorific value is determined by analysis of the gas composition, it shall typically be determined according to ISO 6976 (1995) or better; and

(ii) Where an on-line analytical system is used, its performance shall normally be evaluated according to ISO 10723 (1995) or better.

(c) Transco may evaluate all instruments used in the determination of the CV and witness the calibrations or perform tests on the apparatus.

2.8 Permitted Ranges

(a) The range of measurement (the "**Permitted Range**") and the uncertainty of parameters determined by the Measurement Equipment shall be better than the values defined in the table below, and the frequency with which measurements are taken shall be not less that that specified in the table below:

Characteristic	Unit	Permitted Range	Uncertainty	Frequency
Volume Flow Rate	MSCM/day	0-24	±1% of flow	1 min
Energy Flow Rate	MMJ/hour	1-1080	±1.1% of energy	1 min

Gas Pressure	barg	0 – 100	±0.5 barg	1 min
Gas Temperature	°C	-20 – +80	±1 °C	1 min
Hydrocarbon Dewpoint	°C at 27 barg	-80 - +20	±2 °C	12 min
Water Dewpoint	°C at 85 barg	-80 - +20	±2 °C	12 min
Oxygen	Mole %	0 -0.3	±0.02	12 min
Hydrogen Sulphide	mg/SCM	0 – 5	±0.1 mg/SCM	12 min
Total Sulphur	mg/SCM	0 – 100	±1 mg/SCM	12 min
Incomplete Combustion factor		0.4 - +2	±0.02	2 min
Soot Index		0.45 – 0.65	±0.002	2 min
Inert Gases (including Carbon Dioxide and Nitrogen)	Mole%	1 – 20	±0.2mole%	12 min
Nitrogen	Mole%	0 – 10	1 % of Range	12 min
Carbon Dioxide	Mole%	0 - 3	1% of Range	12 min
CV	MJ/SCM	35 – 45	±0.1 MJ/SCM	12 min
Relative Density		0.5 - 0.8	±0.01	12 min
Wobbe	MJ/SCM	45 – 54	±0.1 MJ/SCM	2 min

(b) For the avoidance of doubt, the maximum hourly flow rate set out in the table above is quoted in respect of volume, as Standard Cubic Metres of gas and, in respect of energy, in Megajoules, both as defined in this Agreement. Such rate does not constitute for the purposes of the Network Code or otherwise an indication of the available capacity in respect of the System Entry Point.

2.9 Communication Interface

(a) Communications are required for two purposes, operational monitoring and measurement validation.

(b) The DFO shall install, commission, operate and maintain communication equipment to provide signals to Transco of type, quality, quantity and frequency to be agreed between Transco and the DFO. The requirement shall include:

Characteristic	**Unit**	**Permitted Range**	**Transmittal mode**	**Frequency**

Instantaneous standard volume flow rate	MSCM/day	0 – 24	Analogue	1 min
Instantaneous energy flow rate	TJ/day	0 – 1080	Analogue	1 min
Integrated standard volume flow	MSCM/day	1 pulse equal to 1000 SCM	Digital	1 min
Integrated energy flow	TJ/day	1 pulse equal to 40000 MJ	Digital	1 min
Gas Pressure	barg	0 – 100	Analogue	1 min
Gas Temperature	°C	-20 - +80	Analogue	1 min
Hydrocarbon Dewpoint	°C at 27 barg	-80 - +20	Analogue	1 min
Water Dewpoint	°C at 85 barg	-80 - +20	Analogue	1 min
Oxygen	Mole %	0 -0.3	Analogue	1 min
Hydrogen Sulphide	mg/SCM	0 – 5	Analogue	1 min
Total Sulphur	mg/SCM	0 – 100	Analogue	1 min
Incomplete Combustion factor		0.4 – 2	Analogue	1 min
Soot Index		0.45 – 0.65	Analogue	1 min
Inert Gases (including Carbon Dioxide and Nitrogen)	Mole%	0 – 20	Analogue	1 min
Nitrogen	Mole%	0 – 10	Analogue	1 min
Carbon Dioxide	Mole%	0 – 3	Analogue	1 min
CV	MJ/SCM	35 – 45	Analogue	1 min
Relative Density		0.5 - 0.8	Analogue	1 min
Wobbe	MJ/SCM	45 – 54	Analogue	1 min
Meter suspect alarm			Digital	1 min
AIO / GasPT deviation alarm			Digital	1 min

(c) The signals shall be provided as Ethernet Modbus or hardwired as agreed by both Parties.

2.10 Validation

(a) The Measurement Equipment shall be validated prior to any gas flow being allowed to or from the System.

(b) The procedures for the validation and subsequent revalidation shall be agreed between both Parties.

(c) Either Party may request that the Measurement Equipment be validated at any time in which case any such validation shall be carried out as soon as reasonably practicable. Subject to paragraph 2.10(d), the costs and expense of such validation, and any adjustment or replacement of the components of the Measurement Equipment made as a result of any validation made pursuant to this paragraph 2.10(c) shall, if the Measurement Equipment is found to read without discernible bias and within the Permitted Range, be paid by the Party requesting the validation and in any other case by the operator of the relevant part of the Measurement Equipment.

(d) Either Party may request that the Measurement Equipment be validated if the previous validation took place more than one (1) month previously, and any validation pursuant to this paragraph 2.10(d) shall be carried out as soon as reasonably practicable. The operator of the relevant part of the Measurement Equipment shall bear the costs and expenses of such validation and any adjustment or replacement of the components of the Measurement Equipment made as a result thereof.

(e) Immediately following validation as specified in paragraph 2.10(c) or (d), the individual components of the Measurement Equipment shall be adjusted or replaced as necessary so that the Measurement Equipment reads without bias and within the Permitted Range. Each individual component of the Measurement Equipment shall read within its recommended tolerance. Where the Measurement Equipment is found when so validated to read with a discernible bias, regardless of whether it is within the Permitted Range, then:

(i) the Measurement Equipment shall be assumed to have read with bias during the latter half of the period since last validated and found to be without bias or, if later, since last adjusted to read without bias (except in the case where it is proved that the Measurement Equipment has begun to read outside the Permitted Range on some other date);

(ii) for the purposes of calculating the amount of allowance to be made to or the surcharge to be made on System Users, the quantities read as offtaken from or delivered to the System during the period when the Measurement Equipment is assumed to have read with bias shall be adjusted by an amount corresponding to the amount by which the Measurement Equipment was found on validation to be in error.

(f) Immediately following validation as specified in paragraph 2.10(c) or (d), the individual components of the Measurement Equipment shall be adjusted or replaced as necessary so that the Measurement Equipment reads without bias and within the Permitted Range. Each individual component of the Measurement Equipment shall read within its recommended tolerance. Where the Measurement Equipment is found when so validated to read without bias and outside the Permitted Range then, for the purposes of calculating the

amount of allowance to be made to or the surcharge to be made on System Users the quantities read as offtaken from or delivered to the System during the period when the Measurement Equipment is assumed to have read outside the Permitted Range shall be accepted without adjustment.

(g) Any validation pursuant to this paragraph 2.10 shall be conducted by the operator of the relevant part of the Measurement Equipment, and the operator of the relevant part of the Measurement Equipment shall give reasonable advance notice of such validation to the other Party, and such other Party shall be entitled to be present. The operator of the relevant part of the Measurement Equipment shall provide a validation report to the other Party within fourteen (14) days of any validation stating the results of such validation.

(h) The results of any validation shall be binding on System User(s), Transco and the DFO unless the DFO or Transco shall within fourteen (14) days after receiving the validation report specified in paragraph 2.10(g), give notice to the operator of the relevant part of the Measurement Equipment that it disputes the accuracy of such validation. The DFO or Transco shall not be entitled to dispute the accuracy of such validation solely on the grounds that it did not attend such validation.

(i) At the request of either Party, the Parties shall meet and discuss and endeavour to settle any dispute or failure to agree arising from the application of the provisions of this paragraph 2.10 and if within thirty (30) days after such request they shall have been unable to agree the matter may be referred to an expert for determination (at the request of either Party) in accordance with the provisions set out in Schedule 5.

2.11 Inspection Rights

(a) Either Party shall have the right, upon giving reasonable notice to the operator of the relevant part of the Measurement Equipment, to inspect such part of the Measurement Equipment and the charts and other measurements or test data of the operator of the relevant part of the Measurement Equipment but the reading calibration and adjustment of such and the changing of any charts shall be carried out only by the operator of the relevant part of the Measurement Equipment who shall preserve all original test data, charts and other similar records for a period of three (3) years and shall, at the expense of the other Party, make a copy thereof available to the other Party upon request.

(b) The operator of the relevant part of the Measurement Equipment shall maintain auditable logs that shall include but not be limited to:

(i) System alarms contributing to flow Measurement Equipment fault alarm and to any equipment within the Measurement Equipment;

(ii) Configuration of flow computers and programmable devices within Measurement Equipment; and

(iii) Tests or validations of the Measurement Equipment.

2.12 Measurement Failure

(a) In the event of failure of the equipment for measuring quality of gas to be installed in respect of the System Entry Point:

(i) spot samples shall be taken and analysed at any approved laboratory with sufficient frequency to monitor properly changes in operating conditions. The method and equipment used and installed for taking samples shall be subject to reasonable agreement by the Parties (such agreement not to be unreasonably withheld or delayed); and

(ii) the operator of the relevant part of the Measurement Equipment shall rectify such failure as soon as reasonably practicable;

(b) The intention is to exchange information between the Parties such that no significant energy measurement errors are allowed to accumulate and an agreed end of day number is always achieved. As such:

(i) whenever a significant energy measurement error occurs, other than as included in paragraph 2.10 it will be documented in a mis-measurement report and the reconciliation of the metering errors will be in accordance with reconciliation procedures that will have been agreed with Transco;

(ii) where details of the error are known, to include but not be limited to the start and end dates, error quantity (to include fixed or variable), the error shall be calculated from the available data; and

(iii) where the full details of the error are not known then the normal principle used for reconciliation is that a correction for half of the measurement error shall be applied to the volume/energy for the entire period between the correction to the measurement error and the previous validation check or point at which it can be demonstrated that there was no measurement error.

(c) Reconciliation will be calculated using the end of day data previously recorded on UK-Link.

(d) Where the error cannot be agreed, the matter may be referred to an expert for determination (at the request of either Party) in accordance with the provisions set out in Schedule 5.

2.13 Modifications

The operator of the relevant part of the Measurement Equipment shall provide not less than three (3) months prior written notice to the other Party of any intended modifications to that part of the Measurement Equipment which may affect the measurement of the flow or quality of gas at the System Entry Point. The other Party shall accept the Measurement Equipment (as modified) for flow of gas once the Measurement Equipment (as amended) has been validated (as appropriate).

Part C – Gas Entry Conditions is respect of the LDZ System Entry Point

1. Gas Entry Conditions

1.1 These Gas Entry Conditions shall apply at the System Entry Point.

1.2 The gas will comply with the System's statutory safety requirements.

1.3 Gas delivered to the System at the System Entry Point shall not contain any solid, liquid or gaseous material which would interfere with the integrity or operation of the System or any pipeline connected to such System or any appliance which a consumer might reasonably be expected to have connected to the System. In addition, all gas delivered to the System at the System Entry Points shall be in accordance with the following values:-

(a)	Hydrogen Sulphide	not more than 5mg/CM.
(b)	Total Sulphur	not more than 50mg/CM.
(c)	Hydrogen Content	not more than 0.1 mol%.
(d)	Oxygen Content	not more than 10 ppm.
(e)	Hydrocarbon Dewpoint	not more than minus two degrees Celsius (-2°C) at any pressure up to the delivery pressure provided in paragraph (o).
(f)	Water Content	not more than 50 mg/CM nor such as would cause a water dewpoint more than minus ten degrees Celsius (-10ºC) at the delivery pressure provided in paragraph (o).
(g)	Wobbe Number	shall be between 47.2 MJ/CM, and 51.41 MJ/CM.
(h)	Incomplete Combustion Factor (ICF)	not more than 0.48.
(i)	Soot Index (SI)	not more than 0.60.
(j)	Odour	gas delivered to the System shall be odourised with odourant NB (80% tertiarybutyl mercaptan, 20% dimethyl sulphide), and the odourant injection rate will be 7 mg/scm and may be varied at Transco's written request between 4 mg/scm and 8 mg/scm.
(k)	Carbon Dioxide	not more than 2.0 mol%.
(l)	Total Inerts	not more than 7.0 mol%.
(m)	Gross Calorific Value	shall:-

(i) not be lower than 36.9 MJ/CM or (if greater) the Target CV; and

(ii) not be higher than 42.3 MJ/CM;

provided that gas may be delivered to the System at the System Entry Points with a Gross Calorific Value as low as 1 MJ/CM below the Target CV (provided that the Gross Calorific Value of gas delivered to the Transco System shall not be less than 36.9 MJ/CM) where the DFO is able to demonstrate to Transco's reasonable satisfaction that the flow weighted average calorific value of gas to be delivered to the System at the System Entry Points during the Gas Flow Day in question is not anticipated to be less than the Target CV.

For the purposes of this paragraph (m):-

(A) "**Target CV**" shall mean the lowest of:-

(1) 39.1 MJ/CM real gross dry;

(2) the lowest gross calorific value of gas which Transco reasonably estimates it will be accepting for delivery into the South East LDZ from all Relevant Input Points on the relevant Day; and

(3) the flow weighted average gross calorific value of gas (the calculation of which shall be determined by Transco in accordance with all relevant legislation) which Transco reasonably estimates it will be accepting for delivery into the South East LDZ from all Relevant Input Points and the System Entry Point on the relevant Day less 1MJ/CM;

as from time to time notified by Transco to the DFO as set out below, it being acknowledged that Transco shall not have any liability whatsoever to the DFO, the Delivery Facility Owners or any other person should its estimates above prove to be incorrect. Transco shall inform the DFO at or before 20:00 hrs on D-1 of the Target CV that the DFO must achieve during the Gas Day. In the event that Transco does not inform the DFO of a Target CV by 20:00 hrs on D-1 then it shall be considered that the Target CV for D-1 shall apply to the coming Gas Day. If Transco or the DFO wishes to change the Target CV after 20:00 hrs on D-1 then it shall be by

agreement. If the DFO believes that it cannot meet the Target CV (whether before or during the Gas Day) it shall inform Transco immediately; and

(B) "**Relevant Input Points**" shall mean all System Entry Points (as defined in the Network Code) as may exist from time to time into the South East LDZ (excluding the System Entry Point), and all NTS/LDZ Offtakes (as defined in the Network Code) as may exist from time to time also into the South East LDZ.

(n) Delivery Temperature — shall be between one and thirty eight degrees Celsius (1°C and 38°C).

(o) Pressure — shall be that required to deliver gas into the Transco system taking account of the back pressure as the same shall vary from time to time. The delivery pressure shall be not less than 1.0 bar gauge and not more than 1.7 bar gauge at the valve marked "122" (and the pressure allowable within Day will be determined from actual pressures in the Local Transmission System and by agreement between Transco and the DFO, such agreement not to be unreasonably withheld or delayed) and shall not exceed 38.0 bar gauge at the valve marked "2045" in each case on the diagram in Schedule A to Appendix A.

Incomplete combustion factor (ICF) and Soot Index (SI) have meanings as defined in Part 1 of Schedule 3 of the Gas Safety (Management) Regulations 1996.

1.4 In order to meet the calibration ranges for typical analysis equipment, unless agreed otherwise by the Parties (such agreement not to be unreasonably withheld or delayed), the concentration ranges of the following components in the gas delivered shall be as follows:-

Component	**% mole low**	**% mole high**
Methane	78.00	98.00
Ethane	0.00	12.00
Propane	0.00	7.00
i-Butane	0.00	1.00
n-Butane	0.00	1.00
neo-Pentane	0.00	0.35

i-Pentane	0.00	0.35
n-Pentane	0.00	0.35
C6+ fraction	0.00	0.35

The Parties acknowledge that Transco may require the approval of Ofgem prior to being able to agree to any change to the concentration ranges referred to above, and Transco will act reasonably in seeking approval from Ofgem in an expedient manner, but Transco confirms that it will not otherwise unreasonably withhold or delay its agreement to any such change.

2. Measurement Provisions

2.1 The Measurement Provisions shall be as set out in Appendix D.

3. Points of Delivery

3.1 The points of delivery at the System Entry Point shall be those illustrated in the diagram contained in Schedule A to Appendix A.

Part D –Measurement Provisions in respect of the LDZ System Entry Point

1. The Measurement Provisions shall be as set out in this Appendix D. The provisions of this Appendix D as to the measurement of flow (and determination of volume and energy) and the determination of gas quality, including calorific value of gas, delivered to the System shall apply to the System Entry Point.

2. Installation, Commissioning, Operation and Maintenance of the Measurement Equipment comprised within the Connected Delivery Facility:-

2.1 This Appendix D specifies the metering, sampling, analysis and other equipment (the "Measurement Equipment") at the System Entry Point. The Measurement Equipment shall be installed and maintained to meet the requirements of the Gas (Meters) Regulations 1983 the Gas Safety (Management) Regulations 1996, the Gas Act 1986 and the Gas (Calculation of Thermal Energy) Regulations 1996 (as appropriate).

2.2 General Requirements:

(a) The Measurement Equipment at the Delivery Facility must comply with standards that allow for the determination of the gas quality parameters as stated within the Gas Entry Conditions.

(b) The Measurement Equipment must also determine the volume and energy of all gas transferred between the System and the Delivery Facility under the relevant contractual and regulatory obligations, where applicable. The requirements for these determinations that must be met or exceeded are set out within these Measurement Provisions.

(c) The Measurement Equipment shall be validated prior to any gas flow being allowed to or from the System.

2.3 Gas Quality

(a) Transco shall install, commission, operate and maintain equipment to determine the characteristics defined in the Gas Entry Conditions of any gas that is passed from the Delivery Facility to the System. Such equipment shall meet the following criteria:

(i) All measurement biases shall as far as is practicable be eliminated or compensated for;

(ii) The uncertainty of measurement shall be such that the risk of the DFO and Transco flowing gas that they are both unaware is outwith Schedule 3 of the Gas Safety (Management) Regulations 1996 is minimised. The uncertainties shall be better than those in the specified ranges;

(iii) The sampling system used to obtain the sample of gas for quality measurements shall ensure that the sample is representative of the gas passed between the System and the Delivery Facility and that no change to the gas composition occurs between the sample point and the analytical instrument; and

(iv) Measurements and validation of equipment to make such measurement shall, where feasible, be traceable to national or international standards.

(b) In the event that the gas quality equipment referred to above fails, Transco may require the DFO to cease flow from the Delivery Facility at the affected System Entry Point(s) with immediate effect (taking into account the requirement to shut down equipment on site safely).

2.4 Energy and Volume

(a) Volume measurement:-

The Delivery Facility Operator shall install, commission, operate and maintain flow measurement equipment to determine instantaneous and integrated volume flows out of the Delivery Facility such that:-

(i) All volume flows to the System shall comply with this paragraph;

(ii) All volumes shall be corrected to metric Standard Temperature and Standard Pressure conditions, and reported as cubic metres of gas; and

(iii) The measurement of volume shall be without bias and with an uncertainty of better than plus or minus 1.0% of reading over the specified flow range;

(b) Energy measurement:-

Transco shall install, commission, operate and maintain calorific value measurement equipment to enable the determination of instantaneous and integrated energy flows out of the Delivery Facility such that:-

(i) All volume and energy flows to the System shall comply with this paragraph;

(ii) All energy shall be corrected to metric Standard Temperature and Standard Pressure conditions, and reported in GWh; and

(iii) The uncertainty of the energy flow must be better than ±1.1% of reading over the specified flow range.

2.5 Volume and Energy Calculation

(a) Volume flowrate shall be calculated in accordance with the appropriate standard using a dedicated flow computer that shall accept all signals necessary for the calculation of the total station volume and energy flowrate.

(b) The live input signals from each turbine metering stream shall include but not be limited to:-

(i) turbine meter pulses;

(ii) pressure transmitter;

(iii) temperature transmitter;

(iv) line density (if a chromatograph is not installed);

(v) relative density (if a chromatograph is not installed); and

(vi) gas composition (if a chromatograph is installed).

(c) The flow computer shall accept the results of a calibration carried out at a suitably accredited facility to minimise the error of measurement. The number of calibration points that can be entered shall not be less than five.

2.6 Volume Measurement

(a) The flow measurement system shall be designed, built and installed to BS EN 1776. Further guidance is given in the Institute of Gas Engineers' reports IGE/GM/1 and IGE/GM/4. In addition, the following standards/guidelines shall also apply:

(i) For orifice plate metering systems, BS EN ISO 5167;

(ii) For turbine metering systems, BS 7834 (ISO 9951);

(iii) For ultrasonic metering systems, BS 7965, BS ISO/TR 12765, AGA 9;and

(iv) For any other metering system, such standards/guidelines as may be agreed by Transco.

(b) The uncertainty of the measurement systems must be assessed in accordance with ISO5168 and the relevant parts of ISO5167, ISO9951 and BS 7965 as may be applicable (or such other standards as may be agreed between the Parties).

(c) The calculation of density for the purpose of calculating volume flow and for correction to standard conditions shall be such that:-

(i) All densities shall be determined as kilograms per cubic metre (kg/m3);

(ii) The line density shall be calculated from a gas composition obtained via a gas chromatograph. The calculation of line density will be in accordance with the latest version of the ISO 12213 using a live pressure and temperature; and

(iii) The reference density shall be calculated from gas composition obtained via a gas chromatograph. The calculation of reference density will be in accordance with the latest version of the ISO 12213 using Standard Pressure and Standard Temperature.

(d) The measurement of temperature for the purpose of calculating volume flow and for correction to standard conditions shall be such that:-

(i) Temperatures shall be determined as degrees Celsius (°C); and

(ii) The requirements of the relevant parts of ISO5167, ISO9951 and BS 7965 as may be applicable (or such other standards as may be agreed between the Parties) are met.

(e) The measurement of pressure for the purpose of calculating volume flow and for correction to standard conditions shall be such that:

(i) Pressure shall be determined as bar guage; and

(ii) The requirements of the relevant parts of ISO5167, ISO9951 and BS 7965 as may be applicable (or such other standards as may be agreed between the Parties) are met.

2.7 CV Measurement

(a) Transco shall install, commission, operate and maintain calorific value measurement equipment that operates by chromatography such that:-

(i) All calorific values shall be corrected to Standard Temperature and Standard Pressure, and reported as Megajoules per cubic metre (MJ/CM); and

(ii) The equipment shall read without bias and the uncertainty of the calorific value must be better than plus or minus 0.1% of reading over the specified calorific value range. The determination of uncertainty shall be traceable to national or international standards as appropriate.

(b) The design and operation of the measurement system shall follow all relevant national or international standards, specifically:

(i) Where the calorific value is determined by analysis of the gas composition, it shall typically be determined according to ISO 6976 (1995) or better; and

(ii) Where an on-line analytical system is used, its performance shall normally be evaluated according to ISO 10723 (1995) or better.

(c) The DFO may evaluate all instruments used in the determination of the CV and witness the calibrations or perform tests on the apparatus.

(d) As the Gas (Calculation of Thermal Energy) Regulations 1996 (as amended) apply at the System Entry Point, then the apparatus used for the determination of calorific value will be operated and maintained under direction from Ofgem and will be used for the purposes of calculating flow weighted average calorific value (FWACV) applied to that charging area.

2.8 Specified Ranges

(a) The uncertainty of parameters determined by the measurement system shall be better than the values defined in the table below

Characteristic	**Unit**	**Specified Range**	**Uncertainty**
Volume Flow Rate	CM/hour	0 – 180,000 CM/hour in respect of meter number FIQ 210A, which relates to the connection to the 38 barg system	±1% of flow
		0 – 4000 CM/hour in respect of meter number FIQ 210B, which relates to the connection to the 38 barg system	±1% of flow
		0 – 30,000 CM/hour in respect of meter number FIQ 215, which relates to the connection to the 2 barg system	±1% of flow
CV	MJ/CM	35 – 44	±0.1 MJ/CM
Wobbe	MJ/CM	45 - 55	±0.1 MJ/CM

(b) For the avoidance of doubt, the maximum hourly flow rate set out in the table above is quoted in respect of volume, as Standard Cubic Metres of gas and, in respect of

energy, in Megajoules, both as defined in this Agreement. Such rate does not constitute for the purposes of the Network Code or otherwise an indication of the available capacity in respect of the System Entry Point.

2.9 Communication Interface

(a) Communications are required for two purposes; operational monitoring and measurement validation.

(b) The Delivery Facility Operator shall install, commission, operate and maintain communication equipment to provide signals to Transco at Transco's instrumentation kiosk located at the Delivery Facility, such signals to be of a type, quality and quantity to be agreed between Transco and the DFO. The requirement for each System Entry Point shall include:-

Characteristic	**Unit**	**Specified Range**	**Transmittal mode**
Instantaneous standard volume flow rate	MSCM/day	0 – 4.32 MSCM/day in respect of meter number FIQ 210A, which relates to the connection to the 38 barg system 0 – 0.096 MSCM/day in respect of meter number FIQ 210B, which relates to the connection to the 38 barg system 0 – 0.72 MSCM/day in respect of meter number FIQ 215, which relates to the connection to the 2 barg system	Analogue

Integrated standard volume flow	MSCM/day	0 – 4.32 MSCM/day in respect of meter number FIQ 210A, which relates to the connection to the 38 barg system 0 – 0.096 MSCM/day in respect of meter number FIQ 210B, which relates to the connection to the 38 barg system 0 – 0.72 MSCM/day in respect of meter number FIQ 215, which relates to the connection to the 2 barg system	Digital
Integrated energy flow	TJ/day	0 – 190.08 TJ/day in respect of meter number FIQ 210A, which relates to the connection to the 38 barg system 0 – 4.224 TJ/day in respect of meter number FIQ 210B, which relates to the connection to the 38 barg system 0 – 31.68 TJ/day in respect of meter number FIQ 215, which relates to the connection to the 2 barg system	Digital
Flow measurement fault alarm	-	-	Digital
UPS alarm	-	-	Digital

(c) Transco shall install, commission, operate and maintain communication equipment to provide signals to the Delivery Facility Operator from Transco's instrumentation kiosk located at the Delivery Facility, such signals to be of a, quality and quantity to be agreed between Transco and the DFO. The requirement for each System Entry Point shall include:-

Characteristic	Unit	Specified Range	Transmittal mode
CV	MJ/CM	35 – 44	Analogue
Wobbe	MJ/CM	45 - 55	Analogue

(d) The signals shall be provided as 4-20 mA or volt-free contact signals, RS232, RS485 or modbus as agreed by both parties.

(e) Where there is insufficient telemetry information to enable satisfactory monitoring, the relevant Transco control centre will maintain hourly contact with the Delivery Facility control centre to obtain Wobbe and CV readings, until telemetered information has been recovered. The DFO shall assist Transco in this matter.

2.10 Validation

(a) The Measurement Equipment shall be validated prior to any gas flow being allowed to or from the System.

(b) The procedures for the validation and subsequent revalidation shall be agreed between both parties.

(c) A System User or Transco or the DFO may request that the Measurement Equipment be validated at any time in which case any such validation shall be carried out as soon as reasonably practicable. Subject to paragraph 2.10(d), the costs and expense of such validation, and any adjustment or replacement of the components of the Measurement Equipment made as a result of any validation made pursuant to this paragraph 2.10(c) shall, if the Measurement Equipment is found to read without discernable bias and within the Permitted Range, be paid by the person requesting the validation and in any other case by the owner of the relevant equipment.

(d) A System User or Transco or the DFO may request that the Measurement Equipment be validated if the previous validation took place more than one (1) month previously, and any validation pursuant to this paragraph 2.10(d) shall be carried out as soon as reasonably practicable. The owner of the relevant equipment shall bear the costs and expenses of such validation and any adjustment or replacement of the components of the Measurement Equipment made as a result thereof.

(e) Immediately following validation as specified in paragraph 2.10(c) or (d), the individual components of the Measurement Equipment shall be adjusted or replaced as necessary so that the Measurement Equipment reads without bias and within the permitted range. Each individual component of the Measurement Equipment shall read within its recommended tolerance. Where the Measurement Equipment is found when so validated to read with a discernable bias, regardless of whether it is within the Permitted Range, then:-

(i) the Measurement Equipment shall be assumed to have read with bias during the latter half of the period since last validated and found to be without bias or, if later, since last adjusted to read without bias (except in the case where it is proved that the Measurement Equipment has begun to read outside the Permitted Range on some other date);

(ii) for the purposes of calculating the amount of allowance to be made to or the surcharge to be made on the System Users, the quantities read as offtaken

from or delivered to the System during the period when the Measurement Equipment is assumed to have read with bias shall be adjusted by an amount corresponding to the amount by which the Measurement Equipment was found on validation to be in error; and

(iii) the amount by which the quantity determined to have been offtaken from or delivered to the System on any day differs from the quantity originally determined to have been offtaken on such Day pursuant to any validation or resolution of any dispute in relation thereto shall be treated as the Reconciliation Quantity.

(f) Immediately following validation as specified in paragraph 2.10(c) or (d), the individual components of the Measurement Equipment shall be adjusted or replaced as necessary so that the Measurement Equipment reads without bias and within the permitted range. Each individual component of the Measurement Equipment shall read within its recommended tolerance. Where the Measurement Equipment is found when so validated to read without bias and outside the Permitted Range then, for the purposes of calculating the amount of allowance to be made to or the surcharge to be made on the System Users the quantities read as offtaken from or delivered to the System during the period when the Measurement Equipment is assumed to have read outside the permitted range shall be accepted without adjustment.

(g) Any validation pursuant to this paragraph 2.10 shall be conducted by the owner of the relevant equipment, and such person shall give reasonable advance notice of such validation to the other Party, and such other Party shall be entitled to be present and may attend with the System User(s). The owner of the relevant equipment shall provide a validation report to the other Party and the System User(s) within fourteen (14) days of any validation stating the results of such validation.

(h) The results of any validation shall be binding on the System User(s), Transco and the Delivery Facility Operator unless a System User(s) or (in the case of Transco and the DFO) the Party receiving the report shall within fourteen (14) days after receiving the validation report specified in paragraph 2.10(g), give notice to the Party issuing the report that it disputes the accuracy of such validation. A System User or Transco or the DFO shall not be entitled to dispute the accuracy of such validation solely on the grounds that such party did not attend such validation.

(i) At the request of a System User, the Delivery Facility Operator, all System User(s) and Transco shall meet and discuss and endeavour to settle any dispute or failure to agree arising from the application of the provisions of this paragraph 2.10 and if within thirty (30) Days after such request they shall have been unable to agree the matter may be referred to an expert for determination (at the request of a System User, the Delivery Facility Operator or Transco) in accordance with the provisions set out in Appendix E.

2.11 Inspection Rights

(a) The System User(s), Transco and the DFO shall have the right, upon giving reasonable notice to the owner of the relevant equipment to inspect the Measurement Equipment and the charts and other measurements or test data of the owner of the relevant equipment but the reading calibration and adjustment of such and the changing of any charts shall be carried out only by the owner of the relevant equipment who shall preserve all original test data, charts and other similar records for a period of three (3) years and shall, at the expense of the requestor, make a copy thereof available to the the owner of the relevant equipment upon request.

(b) The Delivery Facility Operator and Transco shall maintain auditable logs that shall include but not be limited to:

(i) System alarms contributing to flow measurement system fault alarm and to any equipment within the measurement system;

(ii) Configuration of flow computers and programmable devices within measurement system; and

(iii) Tests or validations of the measurement system.

2.12 Measurement Failure

(a) In the event of failure of the equipment for measuring quality of gas to be installed in respect of the System Entry Point:-

(i) spot samples shall be taken and analysed at any approved laboratory with sufficient frequency to monitor properly changes in operating conditions. The method and equipment used and installed for taking samples shall be subject to reasonable agreement by Transco and the Delivery Facility Operator (such agreement not to be unreasonably withheld or delayed); and

(ii) the owner of the relevant equipment shall rectify such failure as soon as reasonably practicable;

(b) The intention is to exchange information between the Parties such that no significant energy measurement errors are allowed to accumulate and an agreed end of day number is always achieved. As such:

(i) whenever a significant energy measurement error occurs, other than as included in paragraph 2.10 it will be documented in a mis-measurement report and the reconciliation of the metering errors will be in accordance with reconciliation procedures that will have been agreed between Transco and the DFO;

(ii) where details of the error are known, to include but not be limited to the start and end dates, error quantity (to include fixed or variable), the error shall be calculated from the available data; and

(iii) where the full details of the error are not known then the normal principle used for reconciliation is that a correction for half of the measurement error shall be applied to the volume/energy for the entire period between the correction to the measurement error and the previous validation check or point at which it can be demonstrated that there was no measurement error. This process allows system average prices to be used over the period.

(c) Reconciliation will be calculated using the end of day data previously recorded on UK-Link.

(d) Where the error cannot be agreed the matter may be referred to an expert for determination (at the request of a System User, the Delivery Facility Operator or Transco) in accordance with the provisions set out in Appendix E.

2.13 Modifications

The owner of the relevant equipment shall provide not less than three (3) months prior written notice to the other Party of any intended modifications to the Measurement System which may affect the measurement of the flow or quality of gas at the System Entry Point.

The other Party shall accept the Measurement System (as modified) for flow of gas once the Measurement System (as amended) has been validated (as appropriate).

2.14 Definitions for the purposes of this Appendix D:

MSCM/day	Millions of standard cubic metres per day
Barg	Bar guage
TJ/day	Terrajoules (10^{12} Joules) per day
Validation	Validation of the metering system requires each installed component of the measurement system to be checked to ensure it is still operating in the manner required by the design specification.