Offtake Code Measurement Arrangements

A paper by NGT for the CIWG, 14th July 2004

1. Background

NGT's original proposals for gas measurement at NTS/ DN exit points are set out in the document "Offtake Code Business Rules, January 2004". These were presented to the RAWG on 27th January 2004 and the CIWG on 28th January 2004. NGT believes these proposals remain appropriate.

This paper firstly describes the existing arrangements for gas measurement at both NTS direct connect and NTS/ DN exit points. It then describes the proposed Offtake Code arrangements for NTS/ DN exits.

2. Existing measurement arrangements at NTS exit points

All gas exiting the NTS is measured on a continuous basis. This is necessary both for NTS control purposes, and to enable certain Network Code commercial processes to take place. The measurements are used for several purposes under the Network Code, including allocation of quantities offtaken by shippers and the determination of both NTS and LDZ throughput and shrinkage quantities.

For NTS direct connect exit points the Network Code provides that an ancillary agreement may (or will in the case of CSEPs) specify the details of the measurement equipment and the procedures for establishing the quantities of gas offtaken for Network Code purposes. The measurement provisions in ancillary agreements generally cover:

- The parameters to be measured and/ or calculated, and the methods and standards to be employed. The key parameters are volume, CV and energy.
- Validation procedures, whereby the accuracy of measurement equipment is tested and if necessary the equipment is corrected to read accurately.
- Corrections to be applied to previous readings where measurement equipment is found to be reading in error, and estimates to be made where readings are unavailable.

For NTS/ DN exit points the measurement provisions are not covered contractually as Transco currently owns and operates both the NTS and the DNs. However, internal procedures are in place to ensure that gas at these points is measured to the appropriate standards, that the measurement equipment is validated at appropriate frequencies, and that measurement errors are corrected in a timely fashion. Organisationally, NGT's UK Distribution arm is responsible for measurement equipments at these exit points.

3. Proposed Offtake Code measurement arrangements

It is proposed that the business rules attached at Appendix 1 are used as the basis for drafting Offtake Code provisions relating to measurement arrangements at NTS/ DN exit points. The rules are based on existing ancillary agreement provisions, and have been developed to reflect the fact that ownership of measurement equipment will lie with the DN. Coverage of the rules is summarised below:

Responsibility

DN responsible for measurement

Measured parameters and measurement standards

Technical standards for measurement by DN of:

- Volume (inst. rate and integrated)
- CV, Wobbe Index, relative density
- Energy (inst. rate and integrated)
- Composition (certain cases)
- Nitrogen and carbon dioxide (certain cases)
- Pressure and temperature

Annex specifies uncertainty limits for measured parameters for measurement equipment at each offtake site, based on capability of existing equipment

Validation

Routine – every 12 months at DN cost.

Exceptional – at NTS request by the end of the next day (or within 10 days if flow ceases). If no fault found NTS pays, if fault found DN pays.

Error Correction

Failure notification and error correction

Disputes via expert

Offtake Code Business Rules

4 Measurement

The measurement provisions ensure that gas flowing from the NTS is measured by the relevant DNCo using equipment complying with specified technical standards to determine:

- Volume (on an instantaneous and integrated basis)
- CV (on an instantaneous basis and as an average for a gas day)
- Energy (on an instantaneous and integrated basis)
- Other gas quality parameters (Nitrogen, Carbon Dioxide, Wobbe Index etc…) where required

The measurements are used for several purposes under the Network Code, including allocation of quantities offtaken by shippers and the determination of both NTS and LDZ throughput and shrinkage quantities.

The purpose of this section is to ensure accurate measurement and timely correction of errors. The detailed rules cover inter alia:

- Validation procedures, whereby the accuracy of measurement equipment is tested and if necessary the equipment is corrected to read accurately. This includes routine validation performed at set frequencies by the DNCo as well as rights for NTSCo to request exceptional validation at short notice;
- Corrections to be applied to previous readings where measurement equipment is found to be reading in error, and estimates to be made where readings are unavailable. These corrections and estimates feed into the Network Code calculations;
- A process for dealing with disputes regarding measurement.

4.1 Definition

- Measurement Equipment includes all equipment used to determine the volume, energy and quality of the gas flowing from the NTS at the Offtake.

4.2 Responsibility for Measurement Equipment

- DNCo shall install, operate and maintain in proper working order Measurement Equipment for registering the instantaneous and integrated volume, the instantaneous and integrated energy, and gas quality parameters for all gas flowing from the NTS at each Offtake
- The gas characteristics to be measured and the standards to which the Measurement Equipment shall perform at each Offtake Site shall be recorded in the form set out in Annex 3.
- DNCo shall be responsible for carrying out all validation and maintenance activities for the Measurement Equipment.

4.3 Technical specification

- The Measurement Equipment shall be operated and maintained to measure all flows from the NTS at the Offtake in accordance with all applicable national, international and/or industry standards, as appropriate and in force at the date of installation of the Measurement Equipment. In particular, but without limitation, the Measurement Equipment shall comply with the following regulatory requirements:
    - Gas Act 1986
    - Gas Safety (Management) Regulations 1996
    - Gas (Calculation of Thermal Energy) Regulations 1996

  and the following best practice recommendations and standards:
    - IGE Meter Recommendations (IGE/GM/1 and IGE/GM/4)
    - BS EN 1776; “Gas supply. Natural gas measuring stations. Functional requirement”
    - ISO 5168 “Measurement of fluid flow. Evaluation of uncertainties”
    - BS 1042 “Measurement of Fluid Flow in Closed Conduits”
    - For orifice plate metering systems, BS EN ISO 5167 “Measurement of fluid flow by means of pressure differential devices inserted in circular cross section conduits running full”
    - For turbine metering systems, BS 7834 (ISO 9951) “Specification for turbine meters used for the measurement of gas flow in closed conduits”
    - For ultrasonic metering systems:
        - BS 7965 “The selection, installation, operation and calibration of diagonal path transit time flowmeters for industrial gas applications”
        - BS ISO/TR 12765 “Measurement of fluid flow in closed circuits. Methods using transit time ultrasonic flowmeters”

        - AGA 9 “Measurement of Gas by Multipath Ultrasonic Meters”
        - ISO 10723 (1995) “Natural gas. Performance evaluation for on-line analytical systems”
    - ISO 6976 (1995) “Natural gas. Calculation of calorific values, density, relative density and Wobbe index from composition”
    - For any other measurement system, such standards/guidelines as may be agreed between the parties.
- The version or date of the standard to be complied with shall be that pertaining at the date the Offtake Code came into force, or as otherwise agreed between the parties.
- All Measurement Equipment shall be set to read without bias; the uncertainty of parameters determined by the Measurement Equipment at each Offtake shall be better than the values recorded in respect of that Measurement Equipment in the form set out in Annex 3.
- All measured parameters shall be corrected to UK metric Standard Temperature and Standard Pressure conditions.
- Where standards referenced in this Agreement are updated or replaced, then NTSCo may by notice require that the updated or replacement standards shall be applied to all Measurement Equipment installed after the date of coming into force of the updated or replaced standard.
- Measurement Equipment installed at the date of this Agreement that does not comply with the relevant requirements (as set out above) shall be made by the DNCo to comply with the relevant requirements as and when the Measurement Equipment is substantially modified or replaced.
- All equipment and materials used in the validation of the Measurement Equipment shall be traceable to national or international standards as appropriate.

4.4 Measurement Equipment maintenance schedule

- The provisions relating to Measurement Equipment maintenance are specified in section 7.3

4.5 Routine Validation

- DNCo shall validate Measurement Equipment at least once in each twelve-month period.
- Where new Measurement Equipment is brought into commission, or where Measurement Equipment has been modified, the relevant Measurement Equipment shall be validated prior to allowing any gas to be monitored by it.
- Validation in accordance with this Section 4.5 is termed Routine Validation.
- DNCo shall bear the costs and expenses of Routine Validation and any adjustment or replacement of the components of the Measurement Equipment made as a result thereof.

4.6 Exceptional Validation

- NTSCo may request Exceptional Validation of Measurement Equipment.
- Where such a request is made DNCo shall validate the Measurement Equipment by the end of the following day. If DNCo agrees to cease flows through the Offtake monitored by such Measurement Equipment until the validation is completed, the time period for completion of the validation shall be extended to 10 working days.
- The costs and expenses of Exceptional Validation, and any adjustment or replacement of the components of the Measurement Equipment made as a result thereof shall, if the Measurement Equipment is found to read without discernable bias and within the Permitted Ranges recorded in respect of that Measurement Equipment in the form set out in Annex 3, be paid by NTSCo and in any other case by DNCo.

4.7 Conducting Validation

- DNCo shall give 10 working days advance notice of Routine Validation to NTSCo.
- DNCo shall give notice to NTSCo of Exceptional Validation not more than 4 hours following NTSCo requesting the validation.
- NTSCo shall be entitled to be present at any validation of the Measurement Equipment.
- All validations shall be conducted by DNCo.
- The processes for validation shall be T/PR/ME2 part 3. The processes for validation shall not be amended without the prior consent of NTSCo.
- Immediately following any validation, 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 and each individual component of the Measurement Equipment shall read within its recommended tolerance. Where such adjustment or replacement cannot be carried out immediately, then the rules for measurement equipment rectification under section 4.10 will apply.

4.8 Validation Report

- DNCo shall provide a Validation Report to NTSCo within 14 days of any Routine Validation and within 12 hours of any Exceptional Validation.

4.9 Correction of readings

- Where the Measurement Equipment is found when validated to read with a discernable bias, regardless of whether it is within the Permitted Range, then:
  - If the period over which the Measurement Equipment has read with bias and the size of the bias at all times during such period can be determined with reasonable accuracy then the quantities read as flowing from the NTS shall be adjusted to account for the bias during such period.
  - If the period over which the Measurement Equipment has read with bias can be determined with reasonable accuracy but the size of the bias at all times during such period can not be so determined then the Measurement Equipment shall be assumed to have read with half of the bias determined at validation during the whole of such period and the quantities read as flowing from the NTS shall be adjusted accordingly
  - If neither the period over which the Measurement Equipment has read with bias nor the size of the bias at all times during such period can be determined with reasonable accuracy then the Measurement Equipment shall be assumed to have read with half of the bias determined at validation during the whole of the period since it was last adjusted to read without bias and the quantities read as flowing from the NTS shall be adjusted accordingly

- Where the Measurement Equipment is found when validated to read without bias but outside the Permitted Range then the quantities read as flowing from the NTS during the period since the Measurement Equipment was last adjusted to read within the Permitted Range shall be accepted without adjustment.

4.10 Measurement Equipment rectification

- In the event of failure of the Measurement Equipment or it reading in error (i.e. the Permitted Range is breached):
  - DNCo shall notify NTSCo within 1 hour of identifying the failure or error.
  - If requested by NTSCo, DNCo shall rectify any fault within 24 hours of it being identified. In situations where it is not practicable for DNCo, acting as a Reasonable and Prudent Operator, to rectify such failure within 24 hours, DNCo shall submit proposals for initiating rectification of any such fault within 24 hours of the fault being identified and shall rectify such failure as soon as reasonably practicable.
  - If requested by NTSCo, DNCo shall cease, or where this is not possible for safety reasons, minimise the flow of gas through the relevant Offtake whilst the failure or error exists.
  - If requested by NTSCo, DNCo shall take all reasonable steps to record and store volume / energy measurements at intervals not exceeding 30 minutes for a period of 6 months or since the last validation whichever is the longer for reconciliation purposes such that the effect of the failure of a single component can be calculated.

4.11 Estimation of readings

- Where Measurement Equipment, or any element of it, fails such that it does not provide measurements in the usual way for any period, then the DNCo shall wherever possible obtain the measurements from the working components of the measurement equipment (e.g. the turbine meter and/or flow computer) and estimate the required measurement using this data.
- Where no information can be obtained, then the flows shall be estimated by reference to recent flows through the Offtake in question under similar operating conditions.
- DNCo shall provide NTSCo with information relating to the basis on which any estimates are made.

4.12 Disputes

- The results of any validation as given in the Validation Report shall be binding on the parties unless NTSCo shall within fourteen (14) days after receiving the Validation Report, give notice to DNCo that it disputes the accuracy of such validation. NTSCo shall not be entitled to dispute the accuracy of the validation solely on the grounds that it did not attend such validation.
- Any estimate made pursuant to section 4.11 shall be binding on the parties unless NTSCo shall within fourteen (14) days after receiving such estimate and the supporting information, give notice to DNCo that it disputes the accuracy of such estimate.

- 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 and if within thirty (30) days after such request they have been unable to agree the matter may be referred (at the request of either Party) to an Expert for determination.

4.13 Inspection rights

- NTSCo shall have the right, upon giving five (5) working days notice to DNCo to inspect the Measurement Equipment and the charts and other measurements or test data of DNCo relating to measurements made in the previous 12 month period but the reading calibration and adjustment of such and the changing of any charts shall be carried out only by DNCo
- DNCo shall preserve all original test data, charts and other similar records for a period of seven (7) years and shall at no cost to NTSCo make a copy thereof available to NTSCo upon request as soon as reasonably practicable.

4.14 Records

- DNCo shall, for the purposes of facilitating any data reconciliation or the resolution of any dispute, preserve all measurement data, charts and other similar records relating to Measurement Equipment for a period of seven (7) years and shall at no cost to NTSCo make a copy thereof available to NTSCo upon request as soon as reasonably practicable.
- DNCo shall maintain auditable logs relating to Measurement Equipment that shall include but not be limited to:
    - System alarms contributing to flow measurement system fault alarm and to any equipment within the measurement system;
    - Configuration of flow computers and programmable devices within the measurement system; and
    - Tests or validations of the measurement system.

Annex 3 Measurement Equipment Permitted Ranges

This annex will comprise a template setting out the details of the gas characteristics to be measured and Permitted Range requirements for Measurement Equipment, to be recorded in respect of each Offtake Site. The Permitted Range consists of the allowed range of a flow property, and the uncertainty that the measurement of a property must be less than or equal to.

The gas characteristics to be measured and Permitted Range requirements recorded at the date of this agreement will reflect the capability of Measurement Equipment installed at that time.

In the event that an Offtake has more than one device that measures a property the recorded details will specify which device is the Primary Measurement Equipment.

Table A3.1. Example Permitted Ranges (for Primary Measurement Equipment)

Characteristic	Unit	Specified Range	Uncertainty
Volume Flow Rate	MSCM/day	[ ]	±[1]% of flow within [30%-100%] of the maximum ±[2]% of flow within [20%-30%] of the maximum
Energy Flow Rate	TJ/day	[ ]	±[1.1]% of flow within [30%-100%] of the maximum ±[2.1]% of flow within [20%-30%] of the maximum
Gas Pressure	Barg	[0 – 85]	±[0.5] barg
Gas Temperature	°C	[0 – 40]	±[1] °C
[Carbon Dioxide]	Mole%	[0 – 5]	±[0.1] of measurement
[Nitrogen]	Mole%	[0 – 10]	±[0.1] of measurement
CV	MJ/m^3	[35 – 44]	±[0.4]% of measurement
Relative Density		[0.5 – 0.8]	±[0.01] of measurement
[Wobbe]	MJ/m^3	[45 – 55]	±[0.1] MJ/m^3

Notes:

- The gas characteristics to be measured and the figures indicated for the specified ranges and uncertainties are typical values. The characteristics to be measured and values to be recorded under these provisions will be specific to the Measurement Equipment installed.
- The minimum volume and energy value within the specified range is the Minimum Rate to be applied under section 9.