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SPECIFICATION FOR

BIOMETHANE NETWORK ENTRY FACILITY, REMOTELY OPERABLE VALVE, AND CONTROLS

APRIL 2024

Revision 04/2024

CONTENTS

FOREWORD

This Specification was approved by Jayne Crowley, E&I Engineering Policy Manager, on 22/04/2024 for use by managers, engineers and supervisors throughout Scotia Gas Networks (SGN) and relevant third parties.

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BRIEF HISTORY

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KEY CHANGES

Section	Amendments
Introduction	Added clause to cover reverse compression requirements
4.3.2	Expanded to include the requirement for suitable filtration system at the LPG storage outlet
6.6.1	Updated to include the new GS(M)R requirement to monitor relative density rather than Sooting Index and Incomplete Combustion Factor
6.9.6	Added requirement for 4 telemetered stroke pulses to allow Gas Control to manually calculate odorant concentration.
7.3.5	Minor updates to Communications section
7.4	Wording revised
7.5	Cyber Security requirements have been revised and updated
8	New section to collate all requirements associated with commingling
9.3	New clause regarding changes to DFO assets and the need to communicate those changes to SGN
12.1.2	Documentation – statement on cyber security required as part of final design pack
Appendix C	GSMR / NEA trip setpoints table updated to include Relative Density along with removal of SI and ICF

DISCLAIMER

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MANDATORY AND NON-MANDATORY REQUIREMENTS

In this document:

must: indicates a mandatory requirement.

should: indicates best practice and is the preferred option. If an alternative method is used then a suitable and sufficient risk assessment must be completed to show that the alternative method delivers the same, or better, level of protection.

SPECIFICATION FOR

BIOMETHANE NETWORK ENTRY FACILITY, REMOTELY OPERABLE VALVE, AND CONTROLS

INTRODUCTION

1. This specification sets out the minimum process and functional requirements for the Biomethane Network Entry Facility (BNEF). Any party seeking to inject biomethane into SGN's gas distribution system from their Delivery Facility (see definition in Appendix B) must comply with these requirements.

2. The Network Entry Agreement (NEA) for each BNEF details the site-specific requirements, including ownership, operation, maintenance, and access requirements etc.

3. Although these requirements are expected to apply in the majority of cases and be included in the relevant NEA, SGN reserves the right to amend any aspect of the functional design specification. This is to ensure that gas entering its gas distribution system is compliant with legislative requirements in the particular circumstances of each entry point.

4. Initially, biogas projects installed in SGN's gas distribution systems have employed bespoke designs for injecting biomethane into the gas grid, often based on existing equipment more commonly used within the gas industry. This specification standardises the approach and applies minimum requirements whilst providing assurance that such injection systems are fit for purpose.

5. It is the responsibility for the Delivery Facility Operator (DFO) to supply, install and where necessary obtain any regulatory approval for all the herein specified equipment, including the equipment that is to be adopted and subsequently owned by SGN. This responsibility includes any items such as calibration gases bottles etc. that are required to maintain and operate the BNEF. Note, only SGN approved equipment will be adopted. For this purpose, a list of current suppliers and approved equipment is available on request from SGN.

6. SGN acknowledge that reverse compression facilities may be required by the DFO to facilitate a required injection rate. DFO's should refer to SGN's 4B Connections Charging Statement regarding the establishment of a reverse compression facility. DFOs should also refer to Uniform Network Code Modification 0808 (Reverse Compression) in relation to the operation of a reverse compression facility by an Independent Gas Transporter (IGT).

1. SCOPE

1.1 Unless agreed in writing, all equipment and materials used must be to this specification. Alternative commercial specifications are prohibited.

1.2 This specification sets out the minimum requirements for the Remotely Operable Valve (ROV) and its controls that form part of a BNEF in order to permit safe, efficient and fit-for purpose grid injection of biomethane.

1.3 For clarity, this specification also describes some (not all) of the functionality of the upstream Diverter Valve(s) and their controls, as the valve(s) forms part of the BNEF and has a bearing on the ROV functional requirements.

1.4 Figure 1 below shows the grouping of components forming the biomethane supply chain.

1.5 The BNEF is the facility required to manage entry of biomethane into a gas network.

1.6 It is the responsibility of the DFO to carry out HAZOPS and/or LOPAS to determine the functional safety requirements in accordance with the relevant standards for the biomethane and associated plant including the BNEF. For this purpose, the ROV must not form part of a Safety Instrumented Function (SIF) relating to risks arising from the upstream production and associated plant.

1.7 Biogas Upgrading Plant (BUP) does not form part of the BNEF. Such functions include but are not limited to: -

a) biogas clean-up plant;

b) enrichment with LPG and control of calorific value. Note: blending of LPG can occur physically within the BNEF kiosk;

c) compression, if biomethane is to be injected into distribution systems at Pressures above 7 barg.

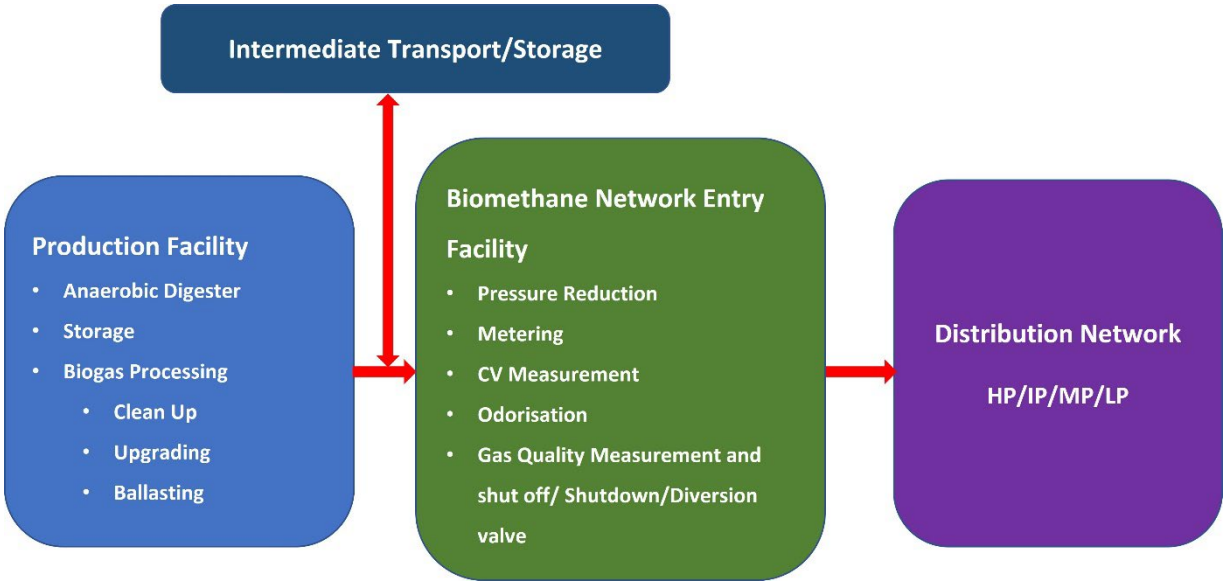

Figure 1 – Biomethane Supply Chain & Component Groups

2. REFERENCES

2.1 This Specification makes reference to the documents listed in Appendix A. Unless otherwise specified, the latest edition of the documents apply, including all amendments.

3. DEFINITIONS

3.1 The definitions applying to this Specification are listed in Appendix B.

4. PRINCIPLES

4.1 Fundamental Principles

4.1.1 The legal obligations upon SGN Ltd. with respect to gas introduced into its gas networks by a third party, as set out in the Gas Safety (Management) Regulations (GS(M)R) and Gas (Calculation of Thermal Energy) Regulations (Gas(COTE)R), are such that criminal liability cannot be delegated to a third party. Therefore, the NEA states that SGN retains control of the ownership, design, operation, and maintenance of the assets listed in 5.1.3. The closure of the ROV must be under the control of both the DFO and SGN. The opening of the ROV must be under the sole control of the SGN.

4.1.2 Gas not complying with the requirements of Part 1 of Schedule 3 of the GS(M)R must not be injected into a gas grid unless an exemption has been granted by the Health and Safety Executive (or National Emergency Coordinator (NEC) in an emergency) from a particular requirement. In such a situation, the DFO and SGN must ensure that any requirements conditional to the granting of such an exemption are met.

4.1.3 Where Ofgem direct SGN to determine calorific value, the facility and its operation must be in accordance with the relevant Letter of Direction (for definition of Directed Site, see Appendix B), including updating the on-site log book for changes and calibration gas and Ofgem test gases must comply with the SGN calibration gas and test gas change procedure within SGN/WI/MAINT/12.

4.1.4 The development, operation and maintenance of the BNEF must conform to the requirements of the Pressure Systems Safety Regulations 2000 for Gas Pressure Systems and Non Gas Systems. The Regulations are concerned with steam at any pressure; gases which exert a pressure in excess of 0.5 bar above atmospheric pressure; and fluids which may be mixtures of liquids, gases and vapours where the gas or vapour phase may exert a pressure in excess of 0.5 bar above atmospheric pressure. The aim of the Pressure Systems Safety Regulations is to prevent serious injury from the release of stored energy as a result of the failure of a pressure system or one of its component parts.

4.2 Measurement Risk Assessment

4.2.1 The DFO and SGN must participate in a measurement risk assessment in accordance with SGN/PM/GQ/8 to determine which parameters must be monitored, the frequency of measurement, and the speed of response of measurement system.

4.2.2 For this risk analysis, a single biomethane and single biogas sample is required before gas is allowed into the Network, and two bio-methane samples after gas enters the Network must be provided for laboratory analysis. Note, once commissioned there will be ongoing monitoring which will reduce in frequency as the plant settles and matures.

4.2.3 The recommended limit values must be assessed by the SGN/PM/GQ/8 risk assessment.

4.2.4 The initial risk assessment must set out those changes (e.g. change of feedstock to the Anaerobic Digester (as defined in Appendix B), equipment change, etc.) that will require a review of the risk assessment. In the event of one or more such changes, a new full spectrum biomethane gas sample and analysis is required for the risk assessment. Where a particular parameter shows increased risk then a change in the monitoring scheme may be appropriate. See note on Operation and Maintenance, Section 13.

4.3 Provisions of the Delivery Facility Operator (DFO)

4.3.1 The DFO must provide biomethane to the BNEF that is compliant with the requirements of Part 1 of Schedule 3 of the GS(M)R, with the exception that it must be unodorised.

4.3.2 Where the strategy for calorific value requires enrichment with LPG, the DFO must provide biomethane with a gross calorific value that equals or exceeds the instantaneous target CV agreed with SGN on a daily basis. The DFO must install suitable filtration on the outlet of the LPG storage vessel to eliminate contamination from the propane which may have detrimental affects on both the DFO and SGN owned assets. Filtration measures must be discussed with SGN prior to implementation.

4.3.3 The DFO must operate the odorant injection equipment so that it adds odorant before the gas exits the BNEF and at the rate agreed with SGN. SGN may for operational reasons, require injection at rates higher or lower than that generally required. This will be communicated via a formal notification in line with the NEA.

4.3.4 The DFO must also provide to SGN telemetry system signals from the BNEF of those parameters identified by the SGN/PM/GQ/8 risk assessment.

4.3.5 The DFO must complete the ROV trip test procedure as part of the commissioning process and supply SGN with an additional up to date copy of the ROV trip test software for future use.

4.3.6 The DFO must agree with SGN a local operating procedure for the management of non-compliant gas. This must include the issuing of a Transportation Flow Advice (TFA) notification, i.e. advance notification of ROV shutdown and procedures for restoration of biomethane flow following ROV closure. SGN will issue to the DFO a

ROV closure template which will be required to be submitted to SGN following a request by the DFO to reopen the ROV.

4.4 Provisions of SGN

4.4.1 SGN will require a suitable pipeline integrity impact analysis in order to assess the risks from dormant internal stress corrosion cracking that might occur downstream of the BNEF. The DFO must provide this analysis either by engaging with SGN or another competent third party.

4.4.2 SGN must provide full details of the format of data for the telemetry interface in order for the DFO to procure suitable equipment to achieve appropriate repeat signals.

5. ASSET OWNERSHIP AND OPERATING MAINTENANCE RESPONSIBILTY

5.1 Asset Ownership

5.1.1 As stated in Section 1, the Network Entry Agreement (NEA) for each BNEF details the site-specific requirements, including ownership, operation, maintenance, and access requirements etc. There must be clear demarcation and separation between assets owned by different parties, e.g. by grouping the assets in separate lockable rooms or enclosures. Please note, any emergency stops or system resets must be under the appropriate asset owners responsibility.

5.1.2 This specification assumes that the primary responsibility for operation and maintenance of any asset rests with the asset owner, although it recognises that commercial arrangements may be in place with third parties to delegate operation and maintenance. Any delegation of operation and maintenance of any BNEF asset must be approved by SGN.

5.1.3 As stated in 5.1.1, for legal reasons, the BNEF assets in the NEA which are to be owned and operated exclusively by SGN are limited to those that carry out the following functions: -

a. Remote Operated Valve (ROV).

b. Telemetry unit and shutdown PLC.

c. Associated telemetry charger and UPS for PLC etc.

d. Telemetry communication system to Gas Control Centre.

e. High Pressure Metering Information System (HPMIS) data router.

f. Primary odour assessment test point.

g. Pressure transmitter on the network side of the ROV; and

h. Any other items, including instrumentation, connected on the SGN network (for limits see 5.1.5).

5.1.4 Other assets associated with the BNEF are those that carry out the following functions:-

a. Pressure Reduction and Control.

b. Diverter Valve(s).

c. Gas Analysis for Compliance Monitoring.

d. Metering.

e. Odorant Injection.

f. FWACV System.

g. Supervisory & Control System.

h. UPS & Battery Chargers.

i. Site Electrical Systems.

j. HPMIS System and Appropriate Data Circuits.

5.1.5 Unless otherwise agreed in the NEA, the End of Network / interface between SGN and DFO equipment are: -

a. Inlet/Upstream Flange of the ROV.

b. (Where required) outlet of ROV air supply isolation valve (isolation valve must be lockable).

c. (If sample point is after the ROV) outlet of FWACV gas sampling line isolation valve (valve must be lockable).

d. Interface box(s) fitted with test point terminals and swing links for instrumentation/control connections.

Note: *The location of Isolation valves should be finalised during the design of the site. To protect the SGN Network, with the exception of the ROV, the interface point is downstream of the ROV Valve(s) and should be in close proximity to the ROV(s) (e.g. 1 to 5 metres).*

5.1.6 A block diagram of the BNEF is set out in Figure 2. Note that the block diagram shows asset groups and not the physical layout of equipment or devices associated with a particular functional block. In particular: the location of the ROV; the location of compression; and the location of LPG enrichment with respect to the diverter valve(s) may vary, depending on the requirements of SGN and arrangements agreed between the DFO and SGN.

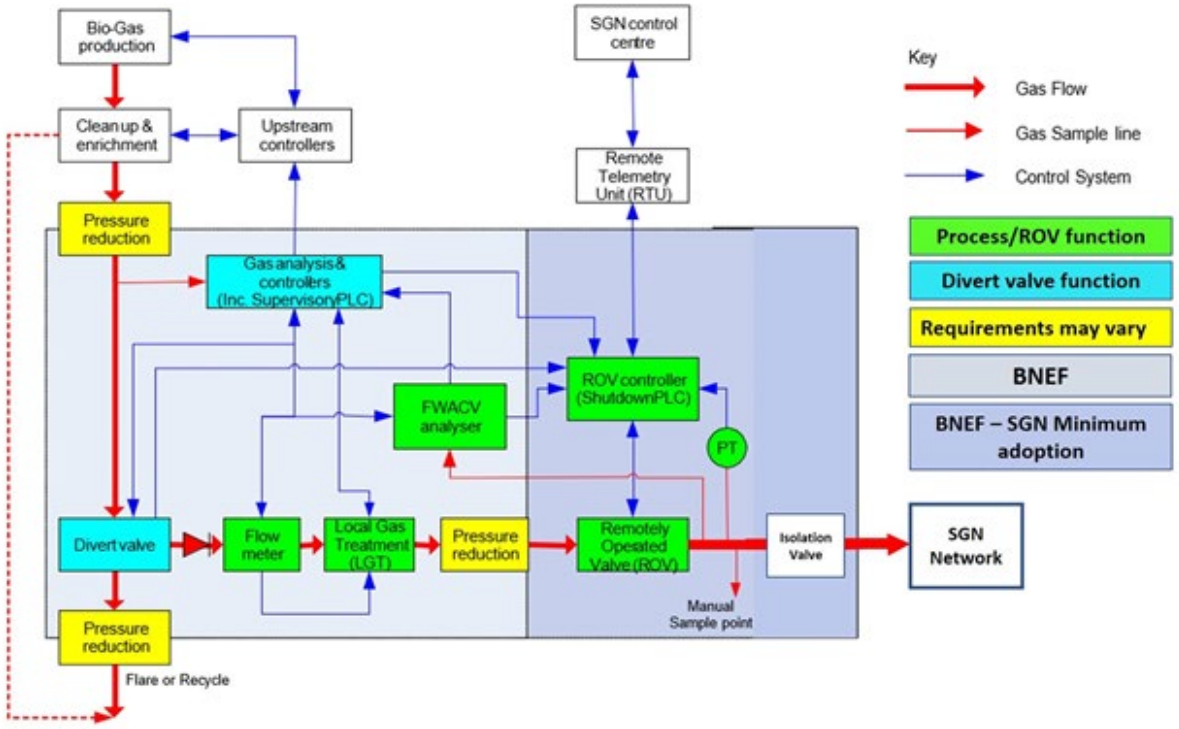

Figure 2 – BNEF Functional Block Diagram

6. FUNCTIONAL REQUIREMENTS

6.1 Production and clean-up plant

6.1.1 The design of the production and clean-up plants should include mitigation processes that ensures that out of specification gas does not flow pass the Diverter Valve(s) towards the ROV. Each stage in the plant (e.g. clean-up plant) should divert or take other measures to ensure only gas that meets the specification is allowed into the next processing stage. The BNEF must not be the only arbitrator in determining that the gas meets the requirements to enter the Network.

6.1.2 Gas production and its feedstock, and the clean-up plant process employed impacts on the trace elements contained in the network-injected gas. The clean-up technology employed therefore needs to consider how to remove, monitor and control these trace elements. On-line analysis will need to be suitably adapted and fast acting to reduce risks.

6.1.3 Consideration should be given to the installation of lead and lag systems to monitor for H2S breakthrough and the auto switching of filters. The design of carbon filter beds should include provision for media replacement, and, where desired, regeneration.

6.1.4 Of all the trace elements, Siloxanes and water are of particular concern. Siloxanes when burnt will build up deposits on end user equipment leading to equipment failure. Water when combined with other trace elements causes significant corrosion and other risks. Consequently: -

a) Additional water dew point measurements should be included in the production/clean-up plants to control the water content in the plant.

b) In the future, additional measures may be required to control the siloxanes content to a new industry level that is below the current 0.23 mg (Si)/m^3 limit, preferably using on-line instrumentation. (Until on-line equipment is available, samples for laboratory test at an agreed frequency will need to be carried out).

6.2 Pressure Regulation and Control System

6.2.1 Pressure regulation and control systems are required to control pressure at the point of injection into the gas distribution network. As gas demand in the network increases and pressure in the distribution network falls the pressure regulation and control system must open the regulator to admit more biomethane.

6.2.2 It is anticipated that the network demand will generally exceed biomethane flow and pressures in the distribution network will permit biomethane flow up to 100% of the agreed daily flowrate (refer to SGN network capacity study for forecast flowrates). Where this is not the case, additional controls will be required, as determined during the Project Initiation Stage.

6.2.3 The maximum biomethane flowrate must be controlled by assets upstream of the BNEF and not by the BNEF. Users demand in excess of biomethane flow will be satisfied by supplies of gas elsewhere in the distribution network.

6.2.4 The BNEF pressure regulation and control system must be fitted with a downstream over pressurisation device to protect the local gas distribution network.

6.2.5 If downstream demand should fall below the biomethane flow then the BNEF pressure regulation and control system must close to reduce the biomethane flowing into the distribution system.

6.2.6 The installation of a Non-Return Valve (NRV) will ensure that backflows from the network of odorised gas does not return to production facility.

6.2.7 Pressure regulation and control must comply with IGEM/TD/13.

6.2.8 Between the ROV and Diverter Valve(s) a fast-acting temperature system must be suitablly located to minimise response times and to ensure gas temperature remains within the set limits defined within the NEA. This must be a separate transmitter fitted for this purpose, not inferred from other devices (i.e. FWACV).

6.2.9 Pipelines must comply with IGEM/TD/1, IGEM/TD/3, or IGEM/TD/17 depending upon operating pressure.

6.2.10 Plant design upstream of the Diverter Valve(s) should consider dead head (static pressure) that might occur through Diverter Valve(s) failure, and/or when the ROV is shut.

6.2.11 Facilities must be provided to permit representative spot samples of biomethane for laboratory analysis to be safely taken. Sample points should be located such that spot checks can be made throughout the various stages of the production process for both biogas and biomethane pre and post propane blending.

6.3 Plant start-up and shutdown

6.3.1 The detailed instructions / processes for plant start up and shutdown will be subject to Local Operating Procedures, These procedures are likely to include the following steps: -

Before starting the BNEF facility and allowing gas through the Diverter Valve(s) towards the gas distribution network: -

a) Purge any gas that is out of specification from BNEF/Network.

b) Inform SGN Gas control.

c) Ensure Remote Operating Valve (ROV) is open.

d) Wait until the gas supplied to the diverter valve(s) meets the Gas Entry Conditions set out in the NEA and Appendix C for a minimum of 10 minutes.

e) For the first 10 minutes of gas entering the grid, the FWACV equipment may detect a deviation condition since it will take a few minutes for the DFO's gas to travel into the FWACV instrumentation and the FWACV cycle time is in the order of 4 to 5 minutes. During this time the Deviation alarm can be suppressed. See Section 6.6.2.

f) Similarly, since the target CV may have changed from when the ROV was last closed, as long as the CV is within the acceptable range, the target CV alarm limits can be suppressed during the same 10-minute start up period.

Note - these suppressions do not apply to any other alarms or process actions unless separately specified in BIO/2.

6.3.2 Before starting a planned shutdown of the BNEF/upstream gas production: -

a) Inform SGN Gas Control intention to shut down the plant.

b) When flow into the network has reduced to the minimum level which is required for accurate metering or LPG flow control (or as a minimum 5% of maximum design flow rate into the Network) or until the gas no longer meets the Gas Entry Conditions set out in the NEA, close the Diverter Valve(s).

c) Close the ROV by requesting SGN Gas Control to do so.

6.4 Gas Sampling and Analysis / BNEF Supervisory PLC

6.4.1 Gas sampling and analysis must continually monitor the biomethane being injected and provide confirmation that it is compliant with the requirements of Part 1 of Schedule 3 of the GS(M)R and that the calorific value meets the minimum requirements agreed with the Gas Transporter (GT - see Appendix B).

Sensor equipment to monitor GSMR compliance must have a daily automated routine calibration function [or validation check to determine sensor replacement on failure].

Sensors should be maintained periodically based on manufacturers' requirements and replaced immediately on failure.

Unless SGN/PM/GQ/8 determines the items do not require to be continually monitored, the parameters that must be monitored are given in Appendix C, the Gas Entry Conditions set out in the NEA and any additional parameter required by SGN/PM/GQ/8 risk assessment.

6.4.2 Calorific value must be determined using an instrument approved by Ofgem for determination of calorific values for the purposes of determining the number of kilowatt-hours, under Section 12 of the Gas Act 1986. The instrument must comply with the requirements listed in an appropriate Letter of Approval from Ofgem.

6.4.3 For control of the Diverter Valve(s), to ensure the Gas Composition presented to the Network is in accordance with the parameters in Appendix C and the Gas Entry Conditions set out in the NEA the sample point must be located upstream of the BNEF Diverter Valve(s).

6.4.4 The Ofgem approved instrument for the determination of calorific values will be subject to an onsite performance evaluation test to BS EN ISO 10723. This test must be carried out before the letter of direction is issued by Ofgem.

6.4.5 The DFO Gas Quality and Supervisory System must monitor biomethane quality signals from the BNEF instrumentation, the remote monitoring unit instrumentation if used, and the delivery facility instrumentation. Monitoring must be continuous and provide confirmation that the biomethane injected into the grid is compliant with the requirements of the Gas Entry Conditions set out in the NEA and the table in Appendix C or any other parameters agreed by SGN/PM/GQ/8 risk assessment.

6.4.6 In the event of any excursion in any of the parameters of the table in Appendix C or any other parameters agreed by SGN/PM/GQ/8 risk assessment, the DFO Gas Quality and Supervisory System must initiate closure of the Diverter Valve(s) to prevent further grid injection of biomethane.

6.4.7 When an excursion has caused a diversion to recirculation/flare and the ROV has not closed, the Diverter Valve(s) may automatically reopen to the network if the parameters in Appendix C are continuously satisfied for a predetermined time to ensure gas quality is stable and unlikely to cause the valve to re-close.

Note: *a minimum of 5 minutes* ***or*** *3 good successive readings, whichever is the longer, by the gas analysers will be sufficent to indicate stability. This functionality must be automated.*

6.4.8 The limit values in the parameters of the table in Appendix C are indicative and site-specific values must be agreed with SGN during design approval process and may be subject to review if risk assessment confirms such a requirement. All alarms and trips must therefore be configurable.

6.4.9 The internal logic must be designed to ensure fail safe integrity is maintained on single failure of electronic parts, specifically any failure of metering, gas quality analysis equipment or parts designed to ensure GS(M)R compliance.

6.5 Diverter Valve(s)

6.5.1 The primary requirement/role of the Diverter Valve(s) is to prevent non-compliant gas reaching the network by diverting it back to the biomethane production facility or to a flare stack. Therefore valve closure (to the Network) must be fast acting, i.e. transit time is less than 5 seconds of being required to close.

6.5.2 The gas sampling instrumentation controlling the Diverter Valve(s) should be located far enough up-stream of the Diverter Valve(s) to ensure that out of specification gas never passes them, i.e. at full flow rates, the sampled gas is analysed up stream and divert valve control action takes place before the body of sampled gas reaches the Diverter Valve(s). The total time for the gas to move from the sample point to the analyser, the analysis delay time, and the time to fully close the Diverter Valve(s) combined, must be less than the gas transit time from the sample point to the Diverter Valve(s). "Fast-acting" gas sampling instrumentation, which reduces analysis time, allows the required pipework length between sample point and diverter valve(s) to be minimised.

6.5.3 The Diverter Valve(s) must be under the control of the DFO's Supervisory PLC, which must be capable of automatic closure in the event of a variation in the biomethane outside of the agreed conditions given in the Gas Entry Conditions set out in the NEA and the table in Appendix C.

6.5.4 The Diverter Valve(s) may be a single valve, or two shutoff valves that operate in tandem to achieve the diversion function. The valve(s) are likely to be of similar construction as the ROV (See 6.6). The design of the system must provide the correct level of differential pressure to permit correct valve operation in line with the design parameters of the valve manufacturer's specification.

6.5.5 The Diverter Valve(s) must be held to recycle/flare position whenever the ROV is not "fully open".

6.5.6 The Diverter Valve(s) should close to fail safe, e.g. the failure of the air supply, which is holding the valve open, must cause the Diverter Valve(s) to close to prevent gas flowing towards SGN's distribution Network.

6.5.7 During chromatograph 35 day tests and daily calibration checks, the Diverter Valve(s) can remain open to the Network, as long as one chromatograph system remains on-line and gives GS(M)R gas compliant results. The calibration of gas analysers shall not occur simultaneously.

6.6 ROV controller / Shutdown PLC

6.6.1 The operation of SGN's ROV will be monitored by a Shutdown Control System, which includes the Shutdown PLC that monitors signals from various sources in the BNEF and trigger the ROV if any input exceeds a trip condition.

The majority of inputs will be from the BNEF Supervisory PLC and e.g.: -

- fast acting CV/Wobbe GS(M)R transducers;
- O_2;
- H_2S;
- H_2;

- H_2O dew point;
- Relative Density of ≤0.700.

6.6.2 Other direct inputs will be from: -

- remote shutdown from the telemetry RTU;
- local emergency stops;
- hardwired 4 to 20 mA signals derived from the GS(M)R transducers
- [poss add coms failure]

To ensure GS(M)R compliance, the Shutdown PLC is required to gather the gas quality data from the DFO Gas Quality and Supervisory System (which uses fast-acting Gas sampling analyser devices) and cross compare these signals with the Ofgem approved analyser gas composition. When the gas composition is measured by both analysers and compared, if the gas composition deviation between them exceeds a predetermined limit (to be determined during detailed design based on equipment used) then this will be signaled via the common deviation alarm on the telemetry. Facilities for individual deviation limits must be settable for comparison gas compositions between the analysers. For elimination of doubt the OFGEM analyser is the primary instrument for determination of compliance for gas entering the downstream SGN network.

6.6.3 When limits to GS(M)R parameters are used to control the ROV (and Diverter Valve(s)), the limit value used must allow for instrument measurement uncertainty such that GS(M)R parameters cannot be exceeded, even with apparently satisfactory readings.

6.6.4 Additionally readings from the installed O2, H2S, H2, and H2O sensors will be alarmed to telemetry.

6.6.5 Water dewpoint instrumentation must measure at atmospheric pressure and must use the LRS (London Research Station) / DNV equation of state to give and display the output reading.

6.6.6 Where a single instrument is provided the failure of the instrument must be considered in the system design to ensure its failure is quickly detected and automatically acted upon. (Normally avoided by cross checking readings between two instruments).

6.6.7 The Shutdown PLC must check that the Diverter Valve(s) has diverted gas in the event of a GS(M)R excursion subject to: -

a) The signal to the Shutdown PLC from the DFOs' diverter valve(s) showing that the valve(s) is "fully closed". This in turn should prevent the ROV from closing.

b) However, when the gas quality being injected into BNEF is out of specification and the Diverter Valve(s) is required to close a grace period will apply before the ROV will close. This period is to allow the Diverter Valve(s) to "fully close" and thereby avoid unnecessary closing of the ROV. The period will be determined during the detailed design and will be determined by considering the time for the valve to close plus a system response allowance.

c) Otherwise, the shutdown PLC will automatically shut the ROV.

6.6.8 If closure of the ROV has been initiated because of non-compliance with the parameters in Appendix C or any other parameters agreed by SGN/PM/GQ/8 risk assessment, then its subsequent opening must be approved by SGN.

Note: Any non-compliant gas trapped downstream of the Diverter Valve(s), i.e. in the network or between the ROV and the Diverter Valve(s), will need manual intervention prior to the re-opening of the ROV. The installation should include suitable provisions to purge non-compliant gas. Refer to LOP back purge procedure.

6.6.9 The Shutdown PLC shall also close the ROV immediately (unless stated otherwise) in the event of: -

a) failure of FWACV equipment or out of specification readings;

Note: *unless rectified, the analyser (SYSTEM 1) fault notification shall delay the ROV closure for 5 hours from first occurrence of the alarm.*

b) failure of the Local Gas Treatment (LGT) that prevents odorisation of the gas passing into the network;

c) failure/ loss of flow metering which will lead to inaccurate FWACV readings;

d) complete communications failure between the BNEF Supervisory PLC and the telemetry (both SGN and DFO);

e) high outlet pressure (secondary action to the upstream pressure reduction slamshut which protects the network from over pressurisation);

f) gas temperature out of range (5 minute delay on start-up);

g) local or remote manual operation; and

h) loss of control of the Diverter Valve(s)

6.6.10 Each time the ROV operates the ROV Shutdown PLC will monitor its transit time. If the transit time exceeds a pre-determined limit an alarm must be logged within the telemetry RTU. Transit time monitoring provides an early indication of possible valve actuator failure or a sticking valve. In this instance, SGN must attend site and confirm the ROV operational condition.

6.6.11 Frequent operation/closure of the ROV (e.g. more than 6 times in an hour) will require on site investigation. Until the DFO and SGN investigations are completed and the ROV is reset on site the ROV must remain locked in the closed position.

6.6.12 Where necessary, to ensure that an excessive net force across the ROV will not prevent the valve opening, the differential pressure across the ROV should be checked before opening. If necessary, remote opening should be inhibited.

6.6.13 The internal logic must be designed to ensure fail safe integrity is maintained on single failure of electronic parts, specifically any failure of metering, gas quality analysis equipment or parts designed to ensure GS(M)R compliance.

6.6.14 The ROV interface shall provide the ability to locally isolate the ROV whilst providing an indication of the ROV position.

6.6.15 The front panel of the interface is to be fitted with the Human Machine Interface (HMI) screen, showing the graphical layout of the process with an indication of the valve position, trip conditions and Local/Remote control indication.

6.6.16 Local on site isolation of the ROV will be via a switch with local and remote indication of switch position (Local/Remote) to the telemetry RTU. Access to the Local/Remote switch must be adequately controlled for both maintenance and cyber security purposes.

6.6.17 Completion of the ROV Activity Log must be undertaken by the DFO and communicated to Gas Control after each ROV closure event (see Appendix F).

6.7 Remotely Operated Valve (ROV)

6.7.1 The primary requirement/role of the ROV is to prevent non-compliant bio-generated gas reaching the network by isolating the BNEF from the network should the Diverter Valve(s) fail to close (see 6.5.1). The ROV can remain open when non-compliant gas is diverted.

6.7.2 The ROV must be under the control of a shutdown PLC, which must be capable of manual, remote or automatic closure in the event of: -

- variation in biomethane outside of the agreed conditions given in of the Gas Entry Conditions set out in the NEA and the table in Appendix C;
- failure of odorisation; or
- inability to provide sufficient commingling where this is practiced.

6.7.3 Actuation of the ROV must be either via compressed air from the DFO or downstream network gas. The choice between these two methods must be agreed with SGN during the detailed design stage of the project and in any event must be compliant with the ROV design specification requirement. The ROV must close to fail safe, e.g. the failure of the actuation gas or air supply, which is holding the valve open, must cause the ROV to close.

6.7.4 Subject to SGN approval for the valve used, the ROV must meet the requirements of GIS/V6 or IGEM/TD/16 as appropriate for the pressure range, and the associated actuator to meet GIS/VA1 or GIS/VA2 as required.

6.7.5 All other fittings within the BNEF and the BNEF outlet pipework (which will form part of the network) must meet Gas Industry Standards.

6.8 Metering

6.8.1 Metering systems must be designed in accordance with the principles of IGEM/GM/8 – Part 1. Gas flow metering installation on each production stream must include at least a single metering stream, the meter(s) must be sized to meet 100% duty for the BNEF, utilising a flow meter with pressure and temperature correction and inputting to a suitable Mass Flow Computer for fiscal measurement.

6.8.2 The meter must be supplied pre-flow calibrated by a NAMAS approved and traceable testing facility with a calibration certificate completed on natural gas at working pressures.

6.8.3 The meter will be calibrated on natural gas at a minimum of 6 flow points over the flow range, with a minimum of 3 repeats at each of the points. Additional calibration points should be considered to cover the low flow region of the meter. The resulting calibration curve should be programmed into the stream flow computer to allow the computer to linearize the meter calibration curve.

6.8.4 For all flow rates, the flow meter and the associated metering system must have a combined uncertainty of less than +/- 1% of volume measurement over the specified range, and less than +/- 1.1% of energy measurement over the specified range unless stated otherwise. See SGN/PM/ME/12.

6.8.5 The BNEF designer should ensure that the required straight lengths upstream and downstream of the flowmeter meets the metering uncertainty specified. See IGEM/GM/8.

6.8.6 Whatever solution is chosen, instantaneous volume and energy flow and integrated daily volume must be available for acquisition by the FWACV system.

6.8.7 An instantaneous volume flow signal (4-20 mA) will be required for the odorant injection system to enable delivery of odorant at the required rate by volume.

6.8.8 The metering design calculations must be verified by the Independent Technical Expert (ITE) prior to commissioning and in any event should comply with the Gas Requirements Manual (GRM) within T/PR/ME/2.

6.8.9 The metering installations and their associated systems on commissioning may require (at the determination of SGN) a certification confirming overall metering performance of the metering installation from an Independent Technical Expert (ITE). (See 10.1.1)

Note: Engaging with the ITE is the responsibility of the DFO. The current list of suitable ITE's is available from the Joint Office of Gas Transporters. (See http://www.gasgovernance.co.uk/MER).

6.9 Odorant Injection

6.9.1 The odorant injection system must be designed in accordance with the principles of IGEM/SR/16, with appropriate allowance for the small-scale operation of BNEFs. The odorant injection system must inject odorant in order to achieve under normal circumstances an odorant concentration between 6 mg/m3 and 9 mg/m3 in the biomethane exiting the BNEF.

6.9.2 In some circumstances, variation from this concentration may be required in order to achieve satisfactory odour intensity within the local gas distribution network so the system must be designed to achieve odorant concentrations over the range 2-18 mg/m3.

6.9.3 Two options for odorant are available depending upon the required concentration and daily volume of biomethane injected: -

a) Odorant NB - 80 wt% (± 2 wt%) TBM, 20 wt% (±2 wt%) DMS.

b) Diluted odorant - Odorant NB 34 wt% (±2 wt%), hexane 66 wt% (±2wt%).

To ensure adequate mixing, choice of odorant and injection rate must be as continuous as possible, with a minimum of at least one stroke pulse per minute of injected odorant.

6.9.4 The odorant injection system must employ a suitable liquid pump. Evaporative or wick odorisers must not be used on gas distribution networks operated by SGN.

6.9.5 The odorant pump controller must accept a signal from the metering system corresponding to the instantaneous volume flowrate of biomethane at reference condition and calculate and control the required odorant injection rate to achieve the appropriate odorant concentration.

6.9.6 SGN Gas Control requires a minimum of 4 telemetered stroke pulses per hour in order to manually calculate the odorant concentration.

6.9.7 The odorant tank at site must be suitable for containing liquid odorant and be either a static tank refill by road tanker or container capable of being transported to the DFO's facility for re-filling by the appropriate service provider. The design of the odorant tank should incorporate an independent low-level indicator and alarm.

6.9.8 Injection of un-odorised biomethane into the gas distribution network must result in the closure of the ROV. Therefore, the design must consider how the replacement odorant tank is installed. The odorant supply must be designed for approximately 6 months continuous site use.

6.9.9 A primary odour assessment test point suitable for use by trained Rhinologists must be installed on the outlet pipework of the BNEF downstream of the ROV. The location of the primary test point must be such that tests made at the point are unambiguously related to the upstream odorisation system. The sample point installation must include the permanent pressure reduction equipment (to 20-30 mBar) so that Rhinologists and others can safely take samples at low pressure.

6.10 Flow Weighted Average CV (FWACV)

6.10.1 The system must deliver the functionality required for the FWACV regime, namely requirements set out in the Gas (Calculation of Thermal Energy) Regulations 1996 as amended in 1997 & 2015 and the conditions specified by both the Ofgem Letter of Direction for the BNEF and the Letter of Approval for the chosen CV determination device. Conditions currently specified include the following: -

a) Acquisition and storage of gross CV from the approved CV determination device, together with a flag indicating its quality/suitability for use. For non-continual CV determination devices, the System - CV determination device interface must be such that only one value of each CV determination is acquired.

b) Acquisition and storage of instantaneous volumetric flowrate at the time of acquisition of gross CV.

c) Initiation of daily calibration of CV determination device.

d) Automated tests of apparatus and equipment at periods not exceeding 35 days in accordance with Regulation 6(e) of the Gas (COTE) Regulations. The facility to manually initiate tests of apparatus and equipment either by, or at the request of, the Gas Examiner. Provision of a report as the result of automated or manual tests must be in accordance with Regulation 6(e) of the Gas (COTE) Regulations.

e) Calculation of the daily average CV at the end of each Gas Day in the manner specified by the Letter of Direction. This will require confirmation of the quality of individual records (records are valid if the CV determination device is operating within agreed limits) and averaging of only those records that are correct and for which gas is flowing past the sample point. In addition, a system flag must be stored indicating whether the resulting daily average CV is valid (i.e. the maximum time between valid records is less than 8 hours). Gross CV values during calibration or tests of apparatus and equipment must not be included for averaging.

f) Acquisition and storage of integrated daily volume at the end of the Gas Day.

g) In addition to local storage of individual data acquired, appropriate means of secure transfer of data to the HPMIS owned and operated by SGN. HPMIS currently accepts data as CSV files with appropriate check sum to ensure corrupted data is identifiable and not accepted.

6.10.2 To maintain reliable operation of the FWACV instrumentation, experience has shown that the FWACV instrumentation must remain pressurised/running at all times. The sample downstream of the ROV must be used as this is the optimal take-off point to achieve this unless the design can clearly demonstrate that the FWACV equipment can remain pressurised at all times. A downstream take-off point may have additional operational advantages over other designs and should be the primary position chosen for the sample point location when the design is submitted unless an alternate sample point location is required due to site specific locational conditions which will be considered by SGN on a site-by-site basis. In any event, the FWACV sample point must be located downstream of the diverter valve.

6.10.3 HPMIS is a database that forms the basis by which many of SGN's obligations under the Gas (Calculation of Thermal Energy) Regulations are managed. Data is imported as a CSV file with a fixed data structure that must be adhered to if data is to be located correctly into the HPMIS database. SGN will provide a list of files and file structure to the DFO/BNEF systems developer during the implementation of a new BNEF.

6.10.4 FWACV functionality may vary if alternatives to the CV determination devices currently approved by Ofgem become available. Appendix D lists the approved Ofgem devices and software.

6.10.5 Any software and hardware solutions are acceptable provided they deliver the required FWACV functionality and have been approved by Ofgem. SGN will require demonstration that the required functionality has been delivered. In addition, Ofgem will require testing and approval of any non-approved software and hardware used in the design of the BNEF, by their service provider prior the letter of direction being issued.

7. EQUIPMENT

7.1 Kiosk

7.1.1 A separated walk-in telemetry & control room/kiosk must be provided to house the SGN adopted equipment. The room/kiosk will be of a suitable size to allow the mounting of the telemetry system, housed within a wall-mount enclosure 1000mm high x 800mm wide and the ROV Shutdown system housed within a wall-mount enclosure 1000mm high x 800mm wide (telemetry and ROV shutdown system can be housed within one suitable enclosure). The design must allow for easy access to the inside of both enclosures and must be mounted so that the HMI displays are at a comfortable viewing height for an engineer to operate.

7.1.2 The electrical installation within the SGN control room/kiosk must be installed in order that access can be obtained to all electrical equipment such as distribution boards, battery compartments and emergency isolation devices without the need for climbing, to enable maintenance/operational activities to be carried out safely.

7.1.3 The telemetry & control kiosk housing the equipment must be fitted with thermostatically controlled electrical heating and thermostatically controlled forced air ventilation and / or air conditioning to maintain the interior temperature in the range of 15°C to 45°C (with an outside temperature in the range of -10°C to 40°C). Consideration should be given to the installation of air conditioning for BNEFs which are exposed to direct sunlight.

7.1.4 The telemetry & control room/kiosk must be a safe area and be sealed from potential sources of gas release.

7.2 Remote CV Monitoring Outstation

7.2.1 Monitoring of gas quality at a location remote from the BNEF may be required if commingling of biomethane with gas in the distribution system is practiced. Two scenarios are envisaged where commingling may be carried out: -

a) Where monitoring of oxygen content of the commingled mixture is a specific requirement of any exemption from the requirements of Part 1 of Schedule 3 of the GS(M)R granted by the Health and Safety Executive.

b) Where the requirement to enrich biomethane with LPG may be reduced or eliminated by determination of the calorific value of the commingled mixture.

7.2.2 The remote monitoring outstation must therefore contain an oxygen-monitoring meter injection and/or (if available) a fast-acting gas property instrument for CV determination. The device must be approved by Ofgem as stated in Appendix D, together with a suitable communication system (agreed in advance by SGN) to send the measured values of oxygen content and/or CV of the commingled gas back to the main BNEF Supervisory PLC for onward transmission to the SGN telemetry unit as appropriate.

7.3 Telemetry Equipment

7.3.1 The telemetry system must use an SGN approved outstation to SGN/SP/INE/1 with associated HMI. No hardware interface should be used; instead, all data should be collected over several Modbus/TCP communications' links from various sources including but not limited to the following: DFO Supervisory PLC, SGN ROV shutdown PLC and the FWACV Supervisory System computer. The telemetry panel should include a remote telemetry unit, the HMI, the router and the back-up batteries for the telemetry unit (this should be 12 hours – refer to SGN/PM/INE/2).

7.3.2 The temperature within the telemetry cabinet should be thermostatically controlled to ensure that all components remain within their operational temperature range.

7.3.3 Analogue data from the Supervisory PLC to telemetry outstation must be IEEE single precision floating point format. Analogue data to remote operations must be 15 bit integer with 0-100% ranged as 5461..27306 (This gives an effective analogue loop range from 0 to 24mA for an integer in the range 0..32767), Double-bit Booleans must start on an odd bit address e.g. 10001, 10003 etc.

7.3.4 The telemetry input/output requirements are listed in Appendix E.

7.3.5 Communication Interfaces.

All communication interfaces must be tolerant of disconnection and must automatically recover without operator intervention. The following protocols between BNEF modules and SGN modules are permitted.

TCPMODBUS/TCP

Modbus/TCP interfaces must support the default port 502 and 'keep alive' messages.

MODBUS ASC11

The preferred settings are: -

- 9600, 8, N, 1
- 9600,7, E, 1

MODBUS RTU

The preferred setting is: -

- 9600, 8, N, 1

SERIAL CONNECTIONS

1) Connections between assets under different ownership must be galvanically isolated.
2) Connections between different buildings must use appropriate surge protection.
3) Connections exceeding 10m in length must be RS485 or RS422.
4) Shall use screened cable, with the screen connected at one end only.
5) RS485/422 circuits must use twisted pair cable.

ETHERNET CONNECTIONS

Ethernet connections between assets under different ownership must implement appropriate additional security measures to prevent the propagation of a security breach and should include a Cyber Policy Enforcement Point to include for example: -

1) A dedicated or operating system-based firewall.
2) Control over open TCP ports and protocols.
3) Bandwidth management (to mitigate a denial-of-service attack).

Ethernet connections using copper wiring between separate buildings must: -

1) not exceed 90m;
2) utilise appropriate surge protection;
3) be suitably protected using conduit or cable armour

Ethernet connections exceeding 90m must either: -

1) use fibre-optic technology; or
2) use Ethernet extending equipment - e.g. DSL over twisted pair.

HARDWIRED INTERFACES

Any hardwired interconnections between differently owed assets must: -

1) Be surge protected.
2) Analogue signals must use 4-20mA and be galvanically isolated 4- 20mA.
3) Digital signals must be galvanically isolated e.g. volt-free contacts.

7.4 Communication Equipment

7.4.1 The Telemetry RTU will communicate with the SGN Gas Control system via a primary network technology agreed with SGN and an appropriate site back-up solution. .

Note: It will take SGN communications service providers at least three calendar months to install and test new or refurbished communications links.

Note: To cater for HPMIS and back up telemetry, [SGN may need to conduct an site assessment to conclude on-site specific requirements which may result in a DFO requirement to facilitate these SGN assets.]

7.4.2 Router

The SGN approved type router will be provided by SGN (funded via the Network Connections Agreement charge) to provide the link and control between the DFO FWACV network, and the SGN Telemetry Network. This unit must be mounted within the SGN Telemetry enclosure.

7.4.3 Satellite IDU

The SGN approved type satellite indoor unit (IDU) must be mounted on a suitable shelf within a wall mounted enclosure. The IDU will be procured via SGN’s satellite service provider.

7.4.4 Satellite Dish

The BNEF building must include a suitable mounting point on the outside wall for the satellite dish and pole. The location of this mounting point will be agreed as part of the detailed design. The mounting point must be reinforced to withstand the wind loading on the dish. A suitable cable entry point (IP67 to BS EN 60529) must be included for the satellite cables. [insert SGN specification for satellite dishes].

In some circumstances, the dish may need to be mounted on a stand-alone post and a concrete base, however this will be reviewed on each detailed design. If a stand-alone post and satellite dish are required, then a separate and dedicated earthing rod shall be installed (refer to SGN/PM/EL/13).

The SGN approved satellite dish must also be procured via SGN’s satellite service provider.

7.4.5 Ethernet

The SGN approved type secure Ethernet hub will allow all the units connected to the network to communicate with each other and exchange data and provide instruction to allow the control and SCADA system to function.

7.4.6 Telephone land line

Sites where SGN has no, or marginal mobile phone signal must be provided with a landline for SGN's use. This landline must be terminated within the SGN Kiosk and include facilities to hear incoming calls where SGN staff may be located on site.

7.5 Cyber Security

7.5.1 The DFO must implement a robust cyber security design and environment to comply with SGN/PM/INE/9 "Management Procedure for Cyber Security – Operational Technology", covering the assets owned and operated by the DFO.

7.5.2 For the life of the installed systems, they must be protected at all times from malware and other intrusions by un-authorised third parties. Any remote access provided or granted by the DFO to its internal network should be communicated to SGN in advance of the permissions and/or connection being made to allow SGN to assess the cyber security risks.

7.5.3 The inherent nature of Cyber Security requirements means that the detailed requirements are subject to change/enhancements. Therefore, measures to protect new plants must be discussed with SGN during the design and development of a site.

7.5.4 During the life of the plant, the installed system will be subject to changes to enhance security to minimise potential impact on an installed system. The design should anticipate potential cyber risks that will need protection and identify all attack vectors that could realise the risk. SGN will require information from the DFO including a risk assessment relating to any changes and the required mitigations applied.

7.5.5 A RTU cyber passcode shall be required to ensure authenticated access on all network connected sites. All other networked equipment such as ROV shutdown PLC and Gas Quality Industrial PCs shall have access and identification control implemented, this can be achieved through dedicated user accounts and password management.

A firewall shall be required to provide separation between SGN owned asset RTU and DFO owned assets. The firewall shall be installed in such a way as to ensure only authorised network traffic is passed onto SGN's telemetry and communications networks for the purpose of telemetered and HPMIS data transfer. SGN shall be the asset owner of the firewall.

The SGN/PM/INE/9 OT Equipment checklist shall be utilised to ensure that the equipment used has been approved for use prior to design approval and appraisal.

7.5.6 External communications All SGN owned Network and Information Systems (Operational Technology hardware) shall be secured within lockable cabinets - Physical security access requirements.

7.5.7 SGN and the DFO shall carry out regular cyber security vulnerability scanning to establish any new cyber security risks and / or required mitigations. SGN shall complete the INE/9001 maintenance schedule to ensure passwords are managed and Operational Technology assets have the latest configurations available for recovery.

7.5.8 Cyber security protection measures must be kept up to date and ensure full resilience between DFO and SGN assets. Any cybersecurity risks identified by SGN in the course of day-to-day business may result in SGN taking action to isolate the site from a telecommunications perspective if identified cyber risks are not sufficiently mitigated.

7.6 Electrical

7.6.1 The electrical supply must comply with the requirements of the Electricity Safety, Quality and Continuity Regulations 2002.

7.6.2 The Designer of the BNEF must establish the supply characteristics, form of earthing, fault levels, grading, and load requirements as defined in the BS 7671 by liaison with the electrical supplier.

7.6.3 SGN's incoming electrical supply to the BNEF must be terminated in the SGN telemetry and control room/kiosk. The site and SGN earthing systems must be segregated so that the feeder cable armouring and the SGN earthing systems are separated and the site supply cable armour insulated. The room/kiosk should be clearly identified as the SGN electrical intake.

7.6.4 A distribution board within the SGN kiosk must be used to supply all the SGN adopted equipment, including kiosk and ROV lighting, and small power etc. This distribution board must be supplied via a 1:1 transformer.

7.6.5 The electrical protection provided on the distribution board should provide over current and earth leakage protection for all outgoing circuits. The earth leakage protection should be designed to discriminate with a 1:1 transformer secondary winding earth leakage protection MCCB.

7.6.6 The 1:1 transformer must be designed to trip in the event of an overcurrent in the primary winding, and the primary winding electrical supply must be equipped with earth leakage protection. The design must also allow for earth fault protection in the secondary winding. The primary and secondary transformer protection should not trip on a mains fail and should be protected by a MCB fitted with auxiliary contacts to allow the status of the MCB to be monitored. The protective devices should be housed in an insulated enclosure. SGN can supply further information upon request.

7.6.7 The 1:1 transformer secondary winding earth connection must be designed to allow the monitoring of earth leakage current and to trip the primary MCCB in the event of an earth fault in the secondary winding/electrical system, only when installation methods of Figure 5b or 5c of SGN/SP/EL/13 cannot be met.

7.6.8 The TN-S supply established on the secondary winding of the transformer must form the supply for the incoming protection for the main distribution board.

7.6.9 TN-C-S (PME) earthing arrangements must not be utilised as a form of earthing due to the risk of circulating currents in the gas installation under earth fault conditions. The 1:1 transformer installed as part of the SGN electrical supply, with the neutral point earthing conductor of the secondary winding of the transformer being connected directly to the SGN earth bar as indicated in SGN/SP/EL/13.

7.6.10 An earth bar must be established in the SGN control kiosk including the associated earth electrode system as indicated in fig 2 of SGN/SP/EL/13 (Rev Dec13). Where other exposed metal structures or earthing systems are installed within 2 meters of the SGN installation, they should be insulated until 2 meters is achieved or cross-bonded to the SGN earthing system.

7.6.11 Where a UPS is provided to support critical loads, it should incorporate a static bypass to operate automatically in the event of a UPS fault, with an associated alarm and a wrap-around bypass to enable the UPS and battery system to be removed without disruption to the critical supply. The critical load should be supported for a minimum of eight hours without mains supply.

7.6.12 The electrical supply to the UPS must be protected with overcurrent and earth leakage protection, the earth leakage protection shall be in the form of an appropriately rated residual current RCCD capable of detecting DC faults. The output of the UPS shall be connected directly to the primary winding of an isolation transformer, the secondary winding of the transformer shall have one pole of the winding connected directly to the earth bar indicated in 7.6.10 so as to provide a sound earth return path for the connected load.

7.6.13 The output of the UPS/Transformer should supply a supported load distribution board. The supported load distribution board outgoing protection devices should open all poles of the supply and be equipped with 30mA RCCDs to achieve earth leakage discrimination with the UPS supply RCCD.

7.6.14 SGN personnel must have sufficient area lighting to provide safe access and egress to enable them to work on the SGN equipment during the night. The required illumination levels for both interior and exterior lighting are listed in SGN/SP/EL/1.

7.6.15 Lightning strike risk calculations must be completed to determine if lightning protection is required for the building including radio antenna etc. This must be in accordance with BS EN 62305 Part 2 & guidance from SGN/SP/EL/13.

7.6.16 Where gas is transferred to or from site by road tankers, a tanker earthing point must be provided outside the hazardous area (e.g. at or near the site entrance) as outlined in SGN/SP/EL/13. This is to discharge any static on the tankers to earth prior to moving the tanker to the system connection point in the hazardous area.

7.6.17 The Designer must be aware that the some of the electrical equipment installed must comply with ATEX 99/92/EC (ATEX 137), and 2014/34/EU {which has replaced Directives 94/9/EC (ATEX 95)}.

7.7 Building Construction

7.7.1 The building must feature explosion relief roof above hazardous area compartments; all necessary weatherproofing, drainage and guttering; and doors fitted with door stays, handles, locks and magnetic switches to indicate that the door is open. The doors, when open, must withstand the load from 80 mph winds. The “any-door-not- open” signal must be connected to the telemetry system.

7.7.2 Any internal dividing walls must be sealed (gas tight) so that hazardous area zoning is maintained (specifically safe areas are not compromised). Any ventilation to a compartment must be directly to the outside of the kiosk and not to another kiosk compartment. Similarly forced ventilation must be directly to the outside.

7.7.3 The DFO must provide suitable housing for the calibration gases bottles and the gas analyser equipment. Subject to any supplier recommendations, as a minimum, the temperature within this housing must be maintained to meet the minimum temperature of the calibration bottles, as per the gas bottle certificate. Additionally, the design of this building must achieve safe and unobstructed movement of the calibration bottles into and around the building.

7.7.4 The design and construction of the building(s) must follow all appropriate building regulations and codes.

7.8 Compressors

7.8.1 Any high-pressure compressors utilised by the DFO for the purposes of pressurising the biomethane gas prior to gas entry to the SGN network must be of a design that utilises oil free operation. Any alternative designs which require oil for operation of the compressor must be approved by SGN prior to installation.

7.8.2 Where required, the biomethane producer should implement a monitoring program to ensure that the high-pressure compressor post upgrader plant and oil filtration system is operated and maintained in accordance with the manufacturer’s recommendations, including manufacturer’s operating instructions relating to the blow down procedure to ensure excessive oil and impurities are removed prior to the biomethane gas entering the NEF. This program must be provided to SGN for review and to hold on record.

7.8.3 A coalescence filtration system with a catch pot facility must be installed (where required) post compression to prevent oil carry over to the SGN network from the site. The catch pot should include a limit switch to indicate a high level of oil collection. The catch pots must be monitored at regular intervals for signs of oil deposits from the compressor. The filtration system design should take account the high-pressure compressor output flow, operating pressure and temperature ranges for effectiveness.

7.8.4 The measurement of the lubricating oil consumption in the high-pressure compressor must be recorded monthly in addition to all compressor maintenance activities annually. Mineral oil should not be used for lubrication as this increases the risk for oil carry over.

8. BIOMETHANE AND NATURAL GAS COMMINGLING

8.1 The Gas Calculation of Thermal Energy Regulations provides for biomethane gas to be physically commingled with natural gas in the network to reduce the volume of propane required to be added to the biomethane. To undertake this activity there is a requirement for a remote monitoring station to be located on the SGN network at a suitable location to monitor the CV of the commingled biomethane and natural gas mixture. A suitable control system design should be employed to manage propane injection into the biomethane to maintain an SGN network target CV at the remote monitoring point. Any request for biomethane and natural gas commingling will need to be discussed on a site-by-site basis with SGN to establish whether the biomethane connection location is suitable for commingling. A detailed design assessment of the propane control system and the remote monitoring location will need to be agreed with SGN in advance. Also, to comply with the Gas Calculation of Thermal Energy Regulations requirements SGN will need to establish that there are no offtake points between the input point and the commingling point.

8.2 SGN has an UNC obligation to cooperate with National Gas Transmission with a view to avoiding or minimising CV shrinkage which results from the capping of area calorific values in accordance with regulation 4A (1) of Gas (COTE) Regulations. It is therefore essential that measures are taken to ensure that CV capping is avoided either by enrichment with LPG or, where technically and economically feasible, by commingling with natural gas being conveyed by SGN.

8.3 SGN will undertake an impact analysis (a commingling study) using the historic network pressures/flows, to verify the extent (if any) that gas commingling may occur downstream of the BNEF when the BNEF is in full flow. This is to estimate potential propane savings.

8.4 This impact analysis is required for the SGN/PM/GQ/8 risk analysis and must be made available during LPG management planning stages. The DFO can either engage with SGN to complete the GQ/8 risk analysis or seek the expertise of a competent third party.

9. DESIGN

9.1 General

9.1.1 Human Factors assessments for construction, operation, maintenance (including access arrangements for SGN and others) and de-commissioning must be carried out as part of design process.

9.1.2 Project implementation activities must involve SGN on any aspect of the project that may impact on the equipment to be adopted and the gas that will flow through into the network. As a minimum, this is likely to include functional safety assessments; HAZOP/HAZID; and human factors consideration.

9.1.3 Adequate time must be given for SGN to examine and respond for any queries; design approvals; and notice to attend design and/or progress meetings and workshops. Similarly, all site activities must be notified well ahead of the planned activity date to ensure SGN staff availability.

9.1.4 The following is indicative of the minimum time required to meet the gas delivery date into the network. Actual dates for these any other key events to be in the NEA or by mutual agreement during project meetings.

Weeks	Milestone
- 15	BNEF Design Part C Acceptance (SGN/PM/PS/5 signoff)
- 7	NRO documentation submitted to SGN
0	Gas entry to Network

Note: for Part C Acceptance, the information pack must contain all necessary information including final design calculations to allow the SGN User to review the proposed installation.

9.2 Approval of Assets Owned by SGN

9.2.1 Design approval for all assets owned/to be adopted by the SGN must be managed in accordance Management Procedure SGN/PM/PS/5. If a valid design appraisal (i.e. approved SGN/PM/PS/5) for a Minimum Connection BNEF is available, then a generic design approval under SGN/WI/PS/8 could be acceptable.

9.3 Approval of Assets Not Owned by SGN

9.3.1 Assets owned by the DFO must be managed in accordance with IGEM/GL/5. SGN must have the opportunity to review and comment on the design of all assets owned by the DFO, because whilst the BNEF is a DFO owned asset, the responsibility for GS(M)R compliance cannot be delegated (IGEM/TD/16 Appendix 3).

9.3.2 Changes to DFO assets including any software, hardware or telecommunications links should be communicated to SGN for review and SGN reserve the right to advise the DFO on any perceived risks and potential mitigations.

10. TESTING

10.1 General Requirements

10.1.1 All personnel carrying out testing must be competent and adequately trained to do so.

10.1.2 Cyber security penetration testing. Refer to Section 7.5 Cyber Security.

10.2 Assets Owned by SGN

10.2.1 Electrical and instrument systems and equipment must be tested (including initial inspection) in accordance with BS 7671 and BS EN 60079 part 17.

10.2.2 Pressure testing of all pressure containing components and systems must be carried out in accordance with Work Instruction SGN/WI/PT/1.

10.2.3 All Factory and Site Acceptance Testing must be carried out against written procedures in accordance with SGN/PM/EL/4, which must be agreed and approved with all parties prior to Testing taking place and must take into account all the relevant design documentation and standards.

10.3 Assets not Owned by SGN

10.3.1 Testing of electrical and instrument systems and equipment must be tested (including initial inspection) in accordance with BS 7671 and BS EN 60079 part 17.

10.3.2 All pressure containing components and systems must be pressure tested in accordance with IGEM procedures and declared safe to commission by the DFO. Whilst the BNEF is a DFO owned asset, the responsibility for GS(M)R compliance cannot be delegated (IGEM/TD/16 Appendix 3), therefore SGN must have the opportunity to review and approve the testing procedures of all DFO owned assets and be include in all Factory and Site Acceptance Testing owned by the DFO. This review must include any PSSR inspection reports on the outlet over-pressure protection device.

11. SITE COMMISSIONING

11.1 General Requirements

11.1.1 It is essential that the DFO completes and compiles all the necessary paperwork and certification to be checked and included as part of the SGN Validation and Adoption procedures. Particular attention should be paid to the following:

- FWACV and Letter of Direction (Ofgem).
- The DFO and ITE requirements.
- Design Pack appraisals and reviews.
- Material and Test Certification.
- Maintenance Manuals.
- Site Specific access.
- Stakeholder management plan.
- Legislation and SGN requirements.

11.1.2 All personnel carrying out commissioning and initial validation must be competent and adequately trained to do so.

11.1.3 A written pre commissioning / commissioning procedure must be used for all activities. Initial metering validation must be carried out in order to demonstrate the accuracy of the measurement system.

11.1.4 Non-Routine Operation (NRO) / permits under Safe Control of Operations (GDN/PM/SCO/1) for the ROV and other equipment on the gas distribution network must be completed and approved prior to any work being carried out on site.

11.1.5 To monitor the commissioning progress of a minimum connection plant, SGN use a check sheet that can be adapted to match individual plant requirements. To assist their planning, the DFO may request a copy of this check sheet.

11.1.6 Suitable systems, software or procedures must be provided or agreed to ensure that compliance can be demonstrated, and commissioning parameters captured.

11.2 Assets Owned by SGN

11.2.1 Following completion of pre- commissioning, the telemetry system and Remote Operated Valve system must be commissioned in accordance with the relevant parts of the commissioning procedure.

11.2.2 The requirement to store and maintain master copies of software packages and configurations, as layout out in SGN/PM/INE/8, will take effect at the start of commissioning.

11.2.3 Commissioning and handover will be subject to SGN/WI/PLANT/1.

11.3 Assets Not Owned by SGN

11.3.1 Following completion of pre-commissioning and initial validation checks of the flow and gas quality measurement system. The system must be commissioned in accordance with the relevant parts of T/PR/ME/2. SGN record sheets should be used to record the commissioning activity (and for subsequent periodic maintenance and calibration checks). Template available on request.

12. DOCUMENTATION

12.1 IGEM/GL/5 AND SGN DESIGN, MODIFICATION & REPAIR PACKS

12.1.1 The designer must provide suitable design packages to meet the requirements of the scope of works in accordance with SGN document SGN/PM/PS/5 for SGN owned assets and Institution of Gas Engineers & Managers document IGEM/GL/5 for DFO owned assets. The milestones within the design pack process (e.g. design package available for appraisal) must be shown on the project programme and updated during the project progress meetings.

12.1.2 The instrumentation design packs as outlined in SGN/PM/RE/9 must contain the project drawings, design calculations, alarm response document, final software program with comments and manufactures data sheet. A statement on cyber security should be included in the relevant design pack. The hazardous area drawing must be displayed on site in all locations where individual owners/teams have access. e.g. SGN control room, DFO's plant control room, see SGN/PM/HAZ/5.

12.1.3 Similar packs for civil, mechanical, and pipework design must contain all design calculations, drawings, and manufactures data sheets.

12.1.4 The DFO designer must arrange for approval and full appraisal of the design packs including Health and Safety File.

12.2 Maintenance Manuals

12.2.1 All equipment maintenance and hardware manuals must be supplied on site before site commissioning.

12.2.2 For inclusion in the (site) Local Operating Procedure to SGN/PM/BIO/3 the manual must (as a minimum) also include: -

- SGN Shutdown PLC trip check procedure.
- ROV Cause and Effect table.
- Out of Specification Gas back purge procedure.
- Other procedures that involve SGN and other parties.

13. OPERATION & MAINTENANCE CONSIDERATIONS

13.1.1 Operation & Maintenance of a BNEF is outside this specification. However, as a minimum, a DNO must carry out statutory and regulatory works on the DNO's plant to ensure safe operation of the BNEF, including: -

- Cyber security protection measures. Refer to Section 7.5.8 – Cyber Security
- Functional safety proof testing to relevant sections of BS EN 61508 / BS EN 61511 (if required).
- Hazardous area testing, e.g. BS EN 60079 part 17.
- Electrical safety, e.g. BS 7671.
- Items subject to Ofgem Letter of direction.
- Item subject to Pressure Systems Safety Regulations scheme of examination.
- Instrumentation calibration must be kept up to date (including T/PR/ME/2 and BN ISO 10723 testing).
- Periodic maintenance to ensure equipment and systems are safe and fit for purpose.

13.1.2 An annual review meeting should be held with all interested parties to review the above activities and associated results.

13.1.3 Likewise, SGN must conform to relevant SMF procedures.

13.1.4 Instrumentation under the control of the DNO, that impact upon SGNs' legal duties must have their verifications witnessed by SGN.

13.1.5 Note: as part of the NEA, regularly reviews of the SGN/PM/GQ/8 risk assessment (see section 4.2) must be undertaken, including whenever the producer changes the content of the feedstock. The output of this review may result in changes to the functionality requirements of the BNEF.

13.1.6 To reduce the risks associated with maintenance or project/plant enhancements works, the DFO should consult SGN prior to undertaking this work to determine if the ROV should be shut during this work. If there is any doubt, the ROV should be closed.

13.1.7 Any upstream processes and plant conditions that could lead to breakthrough should be discussed with SGN to minimise the risk of non-compliant gas entering the network. For instance, the life of a batch of GAC media can end suddenly and therefore the gas composition will need greater monitoring towards end of its life. It would therefore be helpful to SGN to be informed of when this is likely to happen.

APPENDIX A – REFERENCES

This Specification makes reference to the documents listed below (see clause 2):

A.1 Statutes and Regulations

	-	Gas Act 1986
Statutory Instrument 2000 No. 128	-	Pressure Systems Safety Regulations
Statutory Instrument 2002 No. 2776	-	The Dangerous Substances and Explosive Atmospheres Regulations (DSEAR). Implementing: - • European Parliament Directive 99/92/EC 1999 (ATEX 137).
Statutory Instrument 2016 No. 1107	-	The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016. • European Parliament Directive 2014/34/EU.
Statutory Instrument 1996 No. 192 {Withdrawn}	-	The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations. Implementing: - • European Parliament Directive 94/9/EC 1994 (ATEX 100a & ATEX 95).
Statutory Instrument 1996 No. 551	-	Gas Safety (Management) Regulations 1996.
Statutory Instrument 1996 No 439	-	Gas (Calculation of Thermal Energy) Regulations.
Statutory Instrument 1997 No 937	-	Gas (Calculation of Thermal Energy) (Amendment) Regulations.
Statutory Instrument 2002 No 3130	-	Gas (Calculation of Thermal Energy) (Amendment) Regulations.
Statutory Instrument 2002 No 2665	-	Electricity Safety, Quality and Continuity Regulations.

A.2 European Standards

BS EN 60079	-	Explosive atmospheres: -
		Part 0 - Equipment – General requirements.
		Part 10-1 - Classification of hazardous areas – explosive gas atmosphere.
		Part 11 - Equipment protection by Intrinsic Safety “i”.
		Part 14 - Electrical installations design, selection and erection.
		Part 17 - Electrical installations inspection and maintenance
BS EN 60529	-	Degree of protection provided by enclosures (IP code).
BS EN 62305	-	Protection against lightning. Part 1 - General principles.
		Part 2 - Protection against lightning. Risk management.
		Part 3 - Protection against lightning. Physical damage to structures and life hazard.
		Part 4 - Protection against lightning. Electrical and electronic systems within structures.
BS EN 61508	-	Functional safety of electrical/ electronic/ programmable electronic safety-related systems.
BS EN 61511	-	Functional safety. Safety instrumented systems for the process industry sector.
BS EN ISO 10723	-	Natural Gas – Performance Evaluation for On-line Analytical Systems.

A.3 British Standards

BS 7671	-	Requirements for electrical installations (The IET Wiring Regulations).

A.4 Institute of Gas Engineers and Managers (IGEM)

IGEM/GL/5	-	Procedures for managing new works, modifications, and repairs.
IGEM/GM/8	-	Non-domestic meters installations. Flow rate exceeding 6 m3/hr and inlet pressure not exceeding 38 bar.
IGEM/TD/1	-	Steel pipelines and associated installations for high pressure gas transmission.
IGEM/TD/3	-	Steel and PE pipelines for gas distribution.
IGEM/TD/13	-	Pressure regulating Installations for natural gas, liquefied petroleum gas, and liquefied petroleum gas/air.
IGEM/TD/16	-	Biomethane injection.
IGEM/TD/17	-	Steel and PE Pipelines for Biogas Distribution.
IGEM/SR/16	-	Odorant systems for gas transmission and distribution.

A.5 SGN Documents

SGN/PM/PS/5	-	Management Procedure for managing new works, modifications, and repairs.
SGN/PM/PS/8	-	Work Instruction for the Creation of Model Designs for use in Managing Medium Risk New Works, Modifications and Repairs.
SGN/PM/GQ/8	-	Management Procedure for Assessing the Requirement for Gas Quality, Calorific Value and Flow Measurement Systems.
SGN/WI/PT/1	-	Work Instruction for Pressure Testing Pipework, Pipelines, Small Bore Pipework and Above Ground Austenitic Stainless-Steel Pipework.
SGN/PM/RE/9	-	Management procedure for instrumentation and electrical records associated with SGN plant.
SGN/PM/BIO/3	-	Management Procedure for Biomethane Network Entry Facility (BNEF) Local Operating Procedures (LOP).
SGN/SP/EL/1	-	Specification for the selection and installation of luminaries and lamps.
SGN/PM/EL/4	-	Procedures for inspection and testing of fixed electrical equipment and systems.
SGN/SP/EL/13	-	Specification for Earthing.
SGN/PM/HAZ/5	-	Management procedure for the compliance with The Dangerous Substances and Explosives Atmospheres Regulations (DSEAR).
SGN/SP/INE/1	-	Specification for Remote Terminal Units - Technical Requirements.
SGN/PM/INE/2	-	Management Procedure for Selection of Telemetry to Operate the SGN Gas Supply System
SGN/PM/INE/3	-	Management Procedure for Selection of Telemetry Points to Operate the SGN Gas Supply System.
SGN/PM/INE/4	-	Management Procedure for the Lifecycle Management of SGN's Alarm and Telemetry Systems
SGN/PM/INE/8	-	Management Procedure for controlling E and I software operating at remote sites.
SGN/PM/INE/9	-	Management Procedure for Cyber Security - Operational Technology
SGN/WI/MAINT/12	-	Work Instructions for Maintenance of Instrumentation Systems and Equipment
SGN/PM/ME/12	-	Management Procedure for Gas Quality, Calorific Value, Volume and Energy Measurement Systems.
SGN/WI/PLANT/1	-	Work Instruction for the Delivery of Plant Projects.

GDN/PM/SCO/1	-	Management Procedure for Safe Control of Operations.
T/PR/ME/2	-	Work Procedure for Validation of Equipment Associated with Measurement Systems for the Calculation of Mass, Volume and Energy Flowrate of Gas.

A.6 Other Documents

GIS/VA1	-	Specification for Fluid Powered Actuators for Two Position (Open/Closed) Quarter Turn Valves
GIS/VA2	-	Specification for the Electric Powered Actuators for Two Position (Open/Closed) Quarter Turn Valves
GIS/V6	-	Specification for Steel Valves for Use with Natural Gas at Normal Pressures Above 7bar and Sizes Above DN15
GIS/V7-1	-	Specification for Part 1: Metal Bodied Line Valves for use at pressures up to 16bar and construction valves for use at pressures up to 7bar

APPENDIX B - DEFINITIONS

The definitions applying to this specification are given below (see clause 3).

Anaerobic digestion	-	Biological process in which microorganisms break down organic matter in the absence of oxygen into biogas and Digestate.
Biogas	-	Gas produced by anaerobic digestion of organic matter.
Biomethane	-	Methane-rich gas produced by upgrading of biogas.
BNEF	-	Biomethane Network Entry Facility. The facility to facilitate the injection of biomethane into gas distribution systems.
BUP	-	Biogas Upgrading Plant.
CSV	-	Comma separated variables.
CV	-	Calorific Value. -
Cyber Policy Enforcement Point	-	Means of enforcing cyber policy and protection
Delivery Facility	-	The facility from which biomethane may be tendered for delivery at the SGN System Entry Point.
DFO	-	Delivery Facility Operator. The operator of the delivery facility.
Directed Site	-	Site at which the SGN has been directed by Ofgem to determine calorific value under Regulations 6(a) and 6(b) of the Gas (Calculation of Thermal Energy) (Amendment) Regulations 1997. Note: there may be more than one directed point on an individual site.
FWACV	-	Flow Weighted Average CV.
Gas(COTE)R	-	Gas (Calculation of Thermal Energy) Regulations.
GT	-	Gas Transporter A body holding a licence under Section 7 of the Gas Act 1986 as amended by the Gas Act 1995 and by the Utilities Act 2000.
GS(M)R	-	Gas Safety (Management) Regulations.
HMI	-	Human / Machine Interface.
HPMIS	-	High Pressure Metering Information System.
ISDN	-	Integrated Services Digital Network.
ITE	-	Independent Technical Experts.

LGT - Local Gas Treatment (Odorisation).

(Site) LOP - The site specific Local Operating Procedure that is subject to SGN/PM/BIO/3.

(Commercial) LOP - The site specific Local Operating Procedure detailed in the NEA.

LPG - Liquefied Petroleum Gas.

Petroleum gas containing principally butane or propane stored and transported as a liquid under pressure.

NAMAS - National Measurement Accreditation Service.

Now run by United Kingdom Accreditation Service (UKAS) as the sole national accreditation body recognised British government to assess the competence of organisations that provide certification, testing, inspection, and calibration services. It evaluates these conformity assessment bodies and then accredits them where they meet the internationally specified standard.

NEA - Network Entry Agreement.

NEC - National Emergency Coordinator has under a Nation Gas Supply Emergency the power to permit the use of gas compliant with Schedule 3 Part II of GSMR, which has a wider acceptable band for Wobbe and ICF.

NRO - Non Routine Operation, (or Non Routine Procedure).

PRI - Pressure Reduction Installation.

ROV - Remote Operated Valve.

SIF - Safety Instrumented Function.

Safety function with a specified Safety Integrity Level (SIL) which is necessary to achieve functional safety and which can be either be, a safety instrumented protection function, or a safety instrumented control function.

SIL - Safety Integrity Level.

Discrete level (one out of four) for specifying the safety integrity requirements of the Safety Instrumented Functions (SIF) to be allocated to the Safety Instrumented Systems (SIS).

SIS - Safety Instrumented Systems.

Instrumented system used to implement one or more Safety Instrumented Functions (SIF). An SIS is composed of any combination of sensor(s), logic solver(s), and final elements(s).

TFA	-	Transportation Flow Advice. Issued by SGN when out off spec gas is tendered for delivery by the DFO. It defines the parameter that is out of specification to the DFO and forms part of the NEA. It allows Gas Control to notify the DFO that the network cannot accept the submitted. Flow nomination. See the NEA for example forms.
UPS	-	Uninterruptible Power Supply.

APPENDIX C – GSMR / NEA TRIP SETPOINTS

The trip setpoints below apply to this specification. (Note: maybe varied by NEA).

Description	Units	Acceptable Range	Uncertainty	Limit	Determined /Derived by:
Calorific Value	MJ/m^3	35 to 44	+/- 0.2	CV Target	NEA
Wobbe index	MJ/m^3	45 to 54	+/- 0.1	47.2 to 51.41	GSMR
Relative Density				≤0.700	GSMR
H_2S	mg/m^3	0 to 10	+/- 0.1	5	GSMR
Water dewpoint 7bar or below	°C	20 to -100	+/- 2.0	-10 @ 7 Bar	LRS/GL equation of state
Water dewpoint above 7bar	°C	20 to -100	+/- 2.0	-10 @ MOP	LRS/GL equation of state
Hydrocarbon dewpoint	°C	20 to -100	+/- 2.0	Not more than -2 at any pressure up to 85 bar g”	GSMR
O_2	mol%	0 to 2.5	+/- 0.01	1.0	GSMR
Total sulphur content	mg/m^3	0 to 60	+/-	50	GSMR
Hydrogen (H_2)	mol %	TBA	+/-	0.1	GSMR
Pressure	Bar	Site dependent	+/- 1%		NEA
Temperature	°C	0 to 20 Deg C	+/- 1.0	TBA	NEA
Flow	sm^3/hr	Site dependent	+/- 1%		NEA
Carbon dioxide	mol %	0 to 7	+/- 0.1	2.5	NEA
Methane	mol%	78 to 100	+/- 0.1	TBA	NEA
Propane	mol%	0 to 7	+/- 0.1	TBA	NEA
Odorant concentration	mg/m^3	2 to 18 7.0 (operating)	+/- 0.1	TBA	NEA

APPENDIX D – OFGEM APPROVED HARDWARE & SOFTWARE DEVICES (CALORIMETER FWACV)

D.1 Ofgem Approved Hardware

Manufacturer	Model
Emerson Daniels	500
Emerson Daniels	700
Elster	Encal 3000 / C6+
Orbital Gas Systems	Gas PT2

D.2 Ofgem Approved Software

Manufacturer	Version
DNV GL - Danint (for Emerson Daniels 500)	12G
DNV GL - Danint (for Emerson Daniels 700)	12G
DNV GL - Encalview (for Encal C6+)	12D
DNV GL – Danint (for Emerson Daniels 700)	12G

APPENDIX E - SGN TELEMETRY SCHEDULE

The following table is an extract from SGN/PM/INE/3 and is for information only. The latest version of SGN/PM/INE/3 must be consulted prior to implementation.

I/O Type	Description	Signal Source	Divert	Close ROV
AI	Outlet Pressure (Down Stream of ROV)	Press. Tx / Shutdown PLC	n/a	Yes
AI	Outlet Pressure (Between Diverter Valve(s) and ROV)	Press. Tx / BNEF Supervisory PLC		
AI	Outlet Pressure (Upstream of Diverter Valve(s))	BNEF Supervisory PLC		
AI	Site Instantaneous Flow	Flow Computer		Yes
AI	Site Instantaneous Energy Flow Rate	Flow Computer		
AI	Integrated Site Flow	Flow Computer		
AI	Integrated Site Energy Flow	Flow Computer		
AI	FWACV Instantaneous CV Value	FWACV Supervisory System		Yes
AI	FWACV Average CV (over 24hours)	FWACV Supervisory System		
AI	FWACV Instantaneous CO2 content	FWACV Supervisory System		
AI	FWACV Instantaneous Nitrogen Content	FWACV Supervisory System		
AI	FWACV Instantaneous Specific Gravity	FWACV Supervisory System		Yes
AI	FWACV Average SG (over 24 hours)	FWACV Supervisory System		
AI	FWACV Wobbe Index	FWACV Supervisory System		Yes
AI	Soot Index	FWACV Supervisory System		No
AI	Incomplete Combustion Factor	FWACV Supervisory System		No
AI	FWACV Flow Temperature	Flow Computer		

AI	FWACV Compressibility	Flow Computer		

I/O Type	Description	Signal Source	Divert	Close ROV
AI	Gas Tracker No1 Instantaneous CV Value	BNEF Supervisory PLC	Yes	If diverter(s) not closed
AI	Gas Tracker No1 Wobbe Index	BNEF Supervisory PLC	Yes	If diverter(s) not closed
AI	Gas Tracker No1 Instantaneous Specific Gravity	BNEF Supervisory PLC	Yes	If diverter(s) not closed
AI	Gas Tracker No2 Instantaneous CV Value	BNEF Supervisory PLC	Yes	If diverter(s) not closed
AI	Gas Tracker No2 Wobbe Index	BNEF Supervisory PLC	Yes	If diverter(s) not closed
AI	Gas Tracker No2 Instantaneous Specific Gravity	BNEF Supervisory PLC	Yes	If diverter(s) not closed
AI	Site Hydrogen Sulphide (Sensor)	BNEF Supervisory PLC	Yes	If diverter(s) not closed
AI	Site Total Oxygen Content	BNEF Supervisory PLC	Yes	If diverter(s) not closed
AI	Water Dew point	BNEF Supervisory PLC		Yes
AI	Target CV Repeat Setpoint	BNEF Supervisory PLC		
AI	LGT Integrated odorant volume Pump A	BNEF Supervisory PLC		
AI	LGT Integrated odorant volume Pump B	BNEF Supervisory PLC		
AI	Battery voltage	SGN RTU		

AO	Target CV Value	SGN RTU		

DI	SCADA Local/Remote	SGN RTU		
DI	Maintenance Key - Site	SGN RTU		

DI	Maintenance Key - LGT	BNEF Supervisory PLC		
DI	Mains Supply / Fail Alarm	BNEF Supervisory PLC		
I/O Type	**Description**	**Signal Source**	**Divert**	**Close ROV**
DI	Battery Charger Status / Fail Alarm	Shutdown PLC		
DI	(Telemetry) Battery Status/ Low Alarm	SGN RTU		
DI	Security Alarm	Door Switches		
DI	Analyser System Alarm (Daniels/FWACV)	FWACV Supervisory System		Yes
DI	Analyser System Alarm (Upstream of Diverter Valve)	BNEF Supervisory PLC	Yes	If diverter(s) not closed
DI	Meter Suspect Alarm (One point per stream)	BNEF Supervisory PLC		
DI	FWACV / DV upstream analyser Error (Deviation) Alarm	BNEF Supervisory PLC		Yes
DI	DV upstream analyser / DV upstream analyser Error (Deviation) Alarm	BNEF Supervisory PLC	Yes	If diverter(s) not closed
DI	SGN RTU / BNEF Comms Link Fail	SGN RTU		Yes
DI	SGN RTU / Shutdown PLC Comms Link Fail	SGN RTU		Yes
DI	FWACV Supervisory System / Shutdown PLC Comms Link Fail	Shutdown PLC		Yes
DI	BNEF / Clean-up Plant Comms Fail	BNEF Supervisory PLC		Yes
DI	BNEF Diverter(s) (to Network) Open Valve Position	BNEF Supervisory PLC		
DI	BNEF Diverter(s) (to Network) Closed Valve Position	BNEF Supervisory PLC + Hard wired to Shutdown PLC		If diverter(s) should be closed
DI	BNEF Diverter(s) Valve Status (Auto/Manual)	BNEF Supervisory PLC		

DI	BNEF Diverter(s) System Fault	BNEF Supervisory PLC		

I/O Type	Description	Signal Source	Divert	Close ROV
DI	BNEF Diverter(s) (to recycle) Open Valve Position	BNEF Supervisory PLC		
DI	BNEF Diverter(s) (to recycle) Closed Valve Position	BNEF Supervisory PLC		
DI	BNEF Diverter(s) (to recycle) Valve Status (Auto/Manual)	BNEF Supervisory PLC		
DI	BNEF Diverter(s) (to recycle) System Fault	BNEF Supervisory PLC		If diverter should be closed
DI	ROV Open Position	Shutdown PLC		
DI	ROV Closed Position	Shutdown PLC		
DI	ROV Status (Local/Remote)	Shutdown PLC		
DI	ROV Fault	Shutdown PLC		
DI	Site not Flowing CV not Attributed	FWACV Supervisory System		
DI	Site Loss of CV (>8hrs)	FWACV Supervisory System		
DI	Target CV Change Excessive	FWACV Supervisory System		
DI	Odorant system Status / Fail Alarm	BNEF Supervisory PLC		Yes
DI	Odorant Inject Pump A Alarm	BNEF Supervisory PLC		
DI	Odorant Inject Pump B Alarm	BNEF Supervisory PLC		
DI	Common Site Odorant Tank Low Alarm	BNEF Supervisory PLC		

I/O Type	Description	Signal Source	Divert	Close ROV
Count	Site Integrated Volume Flow	BNEF Supervisory PLC	n/a	n/a
Count	Site Integrated Energy	BNEF Supervisory PLC	n/a	n/a
Count	Odorant Pump A Integrator	BNEF Supervisory PLC	n/a	n/a
Count	Odorant Pump B Integrator	BNEF Supervisory PLC	n/a	n/a
DI	Compressed Air Status / Fail Alarm	BNEF Supervisory PLC		
DI	Clean-up Plant Running	BNEF Supervisory PLC	Yes	
DO	ROV Remote – Open/Reset	SGN RTU		
DO	ROV Remote - Close	SGN RTU		Yes

APPENDIX F – BIOMETHANE R.O.V ACTIVITY LOG

Biomethane R.O.V. Activity Log

This log must be completed after a site ROV has tripped, prior to Gas Control agreeing to re- open ROV

Please return to gascontrol.operations@sgn.co.uk

Site Name:	
Site Contact Name:	
Site Contact Number:	
Time of R.O.V Closure & reason for trip:	
Time required for resolution:	
Event summary:	
Confirmation of resolution:	
Resolution summary:	
Confirm site conditions are returned to safe state and request SGN to re-open R.O.V Site Reporting Operator: Date:	
Gas Control, confirmation that all screens are returned to normal and satisfied all okay. Gas Control Operator: Date:	

ENDNOTE

Comments

Comments and queries regarding the technical content of this safety and engineering document should be directed to The SHE and Engineering Registrar at

engineering.registrar@sgn.co.uk

Buying documents

Contractors and other users external to SGN should direct their requests for further copies of SGN safety and engineering documents to the department or group responsible for the initial issue of their contract documentation.