Review Group Report

Energy Market Issues for Biomethane Projects (EMIB)

Summary and Recommendations

Area Reviewed	Group Conclusion	Action Required
GDN connection policies	Entry facilities should be provided as a competitive service; GDNs should provide a "minimum connection" (remotely operated valve and suitable telemetry); Entry facilities should comply with an industry standard functional specification; The existing deep connection charging policy should apply; A new transportation charge / credit should be introduced.	GDNs to develop Network Entry Agreements (NEAs). that reflect agreed approach. Functional Specification, to be maintained by GDNs and referenced in relevant NEAs. GDNs to specifically reference entry in Connection Charging Statements.
Network capacity availability	Firm capacity offered by GDNs should be limited to the minimum demand downstream of the entry point; Interruptible capacity should be offered if firm is unavailable; Investment to meet firm capacity commitments should be regarded by Ofgem in the same way as other economically and efficiently incurred network investment.	Entry capacity rights should be enshrined in the relevant NEA. Ofgem to confirm that investment to meet capacity commitments will be regarded in the same way as other economically and efficiently incurred network investment
Technical standards for calorific value (CV)	CV determination devices with a maximum permissible	Interested parties to put forward suitable devices.

	error of +/-0.5 MJ/m3 are recommended.	GDNs to request that Ofgem approve suggested devices.
Gas quality regulation	Risk assessment should determine which gas quality parameters should be monitored, the frequency of measurement and the speed of response of measurement systems; The recommended limit values should also be assessed by risk assessment; The water dew temperature specification should be relaxed; The GS(M)R less than 0.2% oxygen requirement should be reviewed following the conclusion of the current study into the possible effects on pipeline corrosion of elevated oxygen levels; Delivery facilities connected to gas distribution networks should be exempt from the need to hold a Gas Transporter Licence.	NEAs to specify relaxed water dew temperature specification. WWU to complete corrosion study and ENA to put appropriate oxygen level to HSE for approval. DECC to arrange for a Class Exemption from the Gas Transporter Licence in respect of delivery facilities connected to gas distribution networks
Data requirements and transmission	The Gas (Calculation of Thermal Energy) Regulations inappropriately presume GDN ownership of CV measurement equipment The Gas (Calculation of Thermal Energy) Regulations requirements to transfer and store large amounts of data are inappropriate.	DECC should consider amending the Gas (Calculation of Thermal Energy) Regulations to recognise non-GDN ownership of CV measurement equipment; If the regulations are amended to apply to biomethane entry, the amendment should include a reduction in the data requirements.

Introduction

On 16 September 2011, Ofgem issued an invitation to join a Review Group on Energy Market Issues for Biomethane Projects (EMIB). The Joint Office of Gas Transporters was asked to provide a secretariat for the Review. This Report was drafted by the Joint Office and was approved at the 11 May 2012 EMIB meeting. Ofgem's invitation letter included Terms of Reference, which were accepted by the Group. These are attached as Appendix 1 below.

Six EMIB meetings were held to progress the Review, together with six supporting meetings of relevant experts to consider a range of issues. A generic risk assessment was also conducted to support development of a proportionate functional specification. A wide range of parties was involved in the discussions – Appendix 2 provides a list of attendees.

Context

The established requirements for entry to the GB gas network were developed primarily with major beach terminals in mind. Biomethane differs from this traditional entry expectation both in terms of scale and location, being embedded within local distribution networks rather than connected at the perimeter of the National Transmission System.

The first key issue raised in the EMIB discussions was the relative scale of expected biomethane entry. In broad terms, a typical entry point may be about 1,000th of the scale of a beach terminal. Given this, the proportion of costs accounted for by gas transporter requirements for the entry facility (e.g. metering and gas quality assessment and reporting) would be substantially higher if the defined standards and processes are the same as those at beach terminals. This cost, potentially together with complexity associated with entry arrangements, has the potential to deter entry. The group therefore challenged whether the requirements were proportionate in the context of numerous, relatively small, entry points. To the extent that entry costs can be lowered, this could encourage development of additional sources of biomethane, and would help to ensure that undue costs are not introduced to the market.

The scale and number of potential entry points leads to the second key point, which is consistency. Uncertainty was identified as a barrier to entry, with potential entrants not knowing the conditions they have to meet. The REA (Renewable Energy Association) gave examples to the group of substantial variations in the terms and costs that have been quoted by GDNs (Gas Distribution Networks) to potential entrants. It was recognised that establishing a single national set of standards would remove uncertainty and hence a potential barrier to entry. It would also support the development of competitive infrastructure provisions since different providers could develop competing products to deliver the common specification, and cost reductions should also be delivered as a result of requirements being replicated at all sites.

Report on Areas Considered

The group considered each of the areas outlined in the Terms of Reference.

GDN connection policies

Understand how the existing connection policy operates and establish whether this introduces any barriers or uncertainty to facilitating connections to the grid.

The GDNs presented their existing connection policy, which is consistent across the networks. This is based on a deep connections approach – with those connecting to the network asked to meet the full cost of all the work necessary to support that connection, both at the connection point itself and within the network to the extent that investment is necessary to meet the requirements specified by the connecting party. In the context of biomethane entry, this would involve the connectee meeting the costs associated with developing the entry facility. In terms of deeper, within network, investment, the only potential cost foreseen is when there is insufficient downstream demand to accommodate the planned flow into the distribution network. In these cases, it may be possible for the planned flow to be accepted following investment in the network, such as compression, to support a change in flow patterns – with gas being moved upstream. It was accepted that it would be appropriate for any such investment to be funded by those benefiting from the change, and hence that a deep connections policy remains appropriate and is not an undue barrier to entry. It was also noted that a parallel UNC (Uniform Network Code) Modification had been proposed that would introduce a new transportation charge / credit, designed to take account of the network benefits from distributed gas connections, and any additional operating costs associated with the new connection.

Concerns were raised that it could be a barrier to entry if the GDNs were to be responsible for providing all aspects of the entry facility. EMIB considered that, as a general principle, market provision should be relied upon as far as practical. It was therefore felt that a minimum connection policy should be applied. This would involve the GDN undertaking the minimum level of investment needed in order to be able to comply with its obligations. In practice, the expected minimum connection would consist of suitable telemetry plus a remotely operable valve that would allow compliant gas to enter the GDN, but leave the GDN with an ability to physically isolate the entry point and exclude gas if compliance was not maintained. The GDNs may choose to compete to provide other aspects of the entry facility, but the connectee would be responsible for determining its preferred provider.

EMIB recognised that, in order to meet their obligations, the GDNs would wish to specify the requirements that any equipment installed at an entry point would be required to meet. To support this, the GDNs have developed a Functional Specification that sets out the requirements to be met at any entry point that is to be connected to a GDN. The intention is that this Functional Specification may need to be built on to include any specific requirements at a particular entry point, but would be a generic specification that would be referenced in all relevant Network Entry Agreements and be adopted by all GDNs in order to deliver a consistent approach. The latest version of the proposed Functional Specification is attached (Appendix 3). This consistency was recognised as central to avoiding barriers to entry through uncertainty as well as by supporting competitive procurement, and consequently providing confidence about the level of costs incurred which would be subject to normal competitive pressures. It is recommended that, initially, this Functional Specification be maintained by the GDNs. In the future, following practical experience with its application to biomethane projects, the Functional Specification should be adopted and maintained by IGEM (Institute of Gas Engineers and Managers).

While there was general agreement that the bulk of any entry facility could be owned and managed by the connectee, the process for adding odorant raised specific concerns. The GDNs can face cost increases if gas is over-odorised (since this is expected to lead to an increase in the number of public reported escapes). While any failure to odorise the gas can clearly create significant safety concerns, with leaks potentially being undetected, the impact of over-odorisation also raises safety concerns since an increase in the number of reported escapes can divert resources to low risk incidents and consequently have the potential for a delay in dealing with higher risk incidents. The GDNs accepted[1], however, that this risk could be managed contractually, such that odorisation would be treated no differently to other aspects.

As noted above, the group agreed that it was appropriate for a deep connections approach to continue to apply to biomethane inputs in relation to the initial investment in entry facilities and network enhancement (if applicable). However, it has also been recognised that there are potentially additional network costs and benefits associated with distributed gas connections, compared with gas supplied to Local Distribution Zones (LDZs) from the National Transmission System (NTS). A new system entry charge/credit to reflect these costs and benefits has been developed by a UNC Workgroup (UNC391), meeting in parallel with EMIB, which has recommended the introduction of such a charge/credit. The proposals for a suitable charge will go to the UNC Modification Panel and wider consultation and, if agreed, are likely to be introduced sometime in 2013.

The proposal is to introduce a new LDZ system entry commodity charge which would reflect:

- The additional forecast operating costs of the GDN-owned entry facility and those of any deep network assets directly related to the new entry flow;
- The deemed saving in the cost of booked NTS exit capacity for the DN, due to the forecast availability of gas flows at the new entry point leading to deemed lower levels of booked NTS entry capacity than otherwise; and
- The notional typical reduced usage of the LDZ system tiers by gas from the new entry point relative to gas from NTS offtakes into the LDZ system.

The proposed LDZ system entry commodity charge would be specific to each new entry point, and could be positive or negative depending on the relative magnitude of the factors outlined above. Following initial determination, the unit rate for future years would normally be determined by applying an RPI inflation factor (although redetermination from underlying costs and benefits could be carried out in the event that forecasts costs / flows were to change substantially).

Network capacity availability

Consider treatment of capacity for biomethane entry to GDN networks and consider areas for reform.

The group considered that a simple approach is desirable in order to minimize costs and avoid unnecessary barriers to entry. It was therefore recommended that entry capacity rights should be set out in the Network Entry Agreement (NEA) for the relevant entry point. Given that the requirement is generally for a steady flow at all times throughout a year, it was accepted that the maximum capability that could be offered will be equal to the minimum demand downstream of the entry point. It was envisaged that this should be sufficient to accommodate the majority of potential entrants, and that there was little alternative since gas can only enter the network if there is sufficient demand for that gas to be used. EMIB therefore supported capacity being made available up to the minimum demand level.

In cases where the minimum demand is insufficient to accommodate biogas, it was recognised that investment may be able to increase capacity availability. In particular, work is ongoing to establish the viability of adding compression such that gas can be moved upstream and so access demand in other areas of the GDN as a result of being transported to different areas via a higher pressure system. It was agreed that it would be appropriate for the entrant to bear the costs of any such investment since this would be for their benefit rather than any other party – consistent with a deep connections policy approach. In addition, it was accepted that the GDNs should offer interruptible entry capacity. This is likely to be of value in cases where it enables a producer to deliver gas to the grid at most times, while being constrained off at times of particularly low demand – some producers may find this preferable to the cost of investment in light of an assessment of those cost and the probability of interruption.

The Group recognised that changes in demand can occur over time. In these circumstances, it was recognised that it would not seem equitable for the entry agreement to be revisited and the amount of capacity available for entry to be reduced to the new minimum diversified demand – allowing this as a possibility would introduce uncertainty and be a barrier to entry. It was therefore felt that any necessary investment to allow continued entry should be treated in the same way as other network reinforcement. The group recommends that Ofgem confirm that they would expect any such investment to be regarded in the same way as other economically and efficiently incurred network investment.

An ENA position paper providing further information on capacity issues is attached at Appendix 4.

Technical standards for calorific value (CV)

Consider the implication for biogas injection in the context of the existing standards for biomethane CV measurement, and the associated governance regime.

Dave Lander Consulting undertook some analysis to address this issue. The full report, summarized below, is attached at Appendix 5. The analysis supports a view that, for all credible flows of biomethane into gas distribution systems, there would be no expectation of customers being unduly impacted if CV determination devices with a maximum permissible error of +/-0.5 MJ/m3 were considered acceptable. This would, however, create the prospect of competitive development and provision of these devices, with consequential benefits for all parties. The group therefore recommended that all necessary steps should be undertaken to authorize devices that could demonstrate that they are capable of operating within this range.

BACKGROUND

Estimates of the accuracy of domestic consumer billing have been made. The approach used is based on the principles given in a guidance note produced by Marcogaz and is based on estimates of sources of bias and uncertainty in bias of each of the steps used to derive consumers' energy bills. Such sources include measurement equipment (notably the domestic meter, NTS offtake meters and NTS offtake CV determination devices), assumptions behind the fixed factors used for volume conversion required by the Gas (Calculation of Thermal Energy) Regulations, and the variation in CV experienced by consumers in a particular charging area.

Having made estimates of consumer billing accuracy, the impact of reducing the accuracy CV determination for entry of small volumes of gas is estimated. The principal driver for reducing the accuracy of CV determination is to reduce obstacles to uptake of use of renewable gas supplies such as biomethane, but the approach is applicable to entry of small volumes of any gas.

CONCLUSIONS

1) For a typical LDZ, where uncertainty in bias in NTS offtake metering and CV determination are around ±4% and ±0.1 MJ/m3 respectively, the bias in domestic energy metering is estimated to be: -0.445% ±7.42%. The dominant sources of bias and uncertainty in bias are associated with fixed factors for conversion of actual domestic metered volume to reference temperature and pressure.
2) For a typical LDZ, the bias in LDZ energy is estimated to be: 0% ±2.04%. The bias in LDZ energy resulting from the LDZ model is zero because the model assumes that daily volumes and daily CVs are unbiased.
3) Current custom and practice is for CV determination equipment to meet a requirement that (absolute) error in CV should not exceed 0.10 MJ/m^3. This requirement results in insignificant impact on domestic energy metering.
4) Some relaxation in Maximum Permissible Error (MPE) in CV determination may be appropriate, particularly in low volume applications, such as biomethane injection, for which the anticipated daily volumes are so low as to make CV determination accuracy insignificant in respect of impact on the domestic consumer. The appropriate MPE should be decided by consideration of other regulatory issues (such as monitoring of compliance with the GS(M)R if shared duty is being practiced), or normal commercial factors for sale of energy. However, daily flows of up to 2.5 million m^3 could be measured with devices having an MPE of 0.5 MJ/m^3 with no material impact on accuracy of FWACV and hence domestic consumer energy billing.
5) In addition to MPE, a formal performance specification for CV determination devices should include a maximum bias shown by CV determination devices with gases that the instrument (or family of instruments) is likely to see.

Gas quality regulation

Develop an understanding of the current requirements and whether they remain fit for purpose for the injection of biogas.

To establish a consistent approach to gas quality regulation, with proportionate requirements, the existing requirements were reviewed and the Functional Specification (see Appendix 3) captures what the group regards as a fit for purpose regime that should be incorporated in individual NEAs. This specification will initially be maintained by the GDNs, but the group recommends that this becomes an IGEM standard in future. The proposed standards were informed by a generic risk assessment.

It is recommended that at any specific entry point, the biomethane producer and GDN should participate in a measurement risk assessment to determine which gas quality parameters should be monitored, the frequency of measurement and the speed of response of measurement system. The recommended limit values should also be assessed by risk assessment.

The initial risk assessment should set out those changes (e.g. change of feedstock to the Anaerobic Digester, equipment change, etc) that will require review under the risk assessment. In the event of one or more such changes, the risk assessment should be reviewed. Where a particular parameter shows increased risk, then a change in the monitoring scheme may be appropriate.

While accepting that all current safety standards should apply, a question was raised over the costs and benefits of achieving the existing standard for oxygen content. Recognising that his is not a safety issue, Wales & West Utilities is conducting a study into corrosion in order to establish whether it will be acceptable to change the oxygen limits in gas specifications. It is recommended that the requirement in GS(M)R Schedule 3 for pipeline gas to contain less than 0.2% oxygen should be reviewed following the conclusion of the current study into the possible effects on pipeline corrosion of elevated oxygen levels. If the study demonstrates no material increase in corrosion rates with oxygen levels of up to 1%, the HSE should recommend relaxation of the oxygen limit in GS(M)R up to this level. This relaxation offers the prospect of significant cost savings for biomethane producers.

Dewpoint was also addressed in a paper produced by Dave Lander Consulting (see Appendix 6). In light of this analysis, it is recommended that the water dew temperature specification in respect of gas distribution systems should be relaxed from that which currently applies, which is appropriate to NTS pressures and is unduly stringent and costly to achieve for biomethane and other distributed gas inputs:

- water dew temperature to be no greater than -10 0C at 7 barg for injection into below a 7 barg distribution systems; or
- water dew temperature to be no greater than -10 0C at the maximum anticipated pressure for injection onto an above 7 barg (7-16 barg) distribution system.

The Group also noted that there is a potential requirement for biomethane producers to hold a Gas Transporter Licence. The activities that must be authorised by a gas transporter licence are set out in section 5 of the Gas Act, and include the following activity: "the arrangement with a gas transporter for gas to be introduced into, conveyed by means of, or taken out of, a pipeline system operated by that transporter." This includes biomethane (and other gas) inputs into the gas distribution networks, leading to the potentially onerous requirement for biomethane producers (and other distributed gas producers) to hold a gas transporter licence.

However, the Gas Act provides the Secretary of State (for the Department of Energy and Climate Change) with the power to grant an exemption in respect of this activity (and other activities). The purpose of the exemptions is to reduce the regulatory burden for those people for whom holding a licence would be excessive, or onerous. This includes people whose business requirements involve the operation of a pipeline that is not truly part of the gas network, for instance a terminal operator operating a pipeline that connects the terminal with the National Transmission System (NTS). The exemptions associated with the NTS terminals are "Named Exemptions", in other words, they relate to specific geographical locations.
By analogy, it would be appropriate for producers operating delivery facilities that connect into the gas distribution networks to benefit from exemptions from the requirement to hold a gas transporter licence. However, as large numbers of such distribution network-connected delivery facilities are expected, it will be impracticable to operate a Named Exemptions regime. Therefore it would be desirable if a Class Exemption covering all distribution network-connected delivery facilities could be put in place, similar to the Class Exemptions that currently exist for conveying gas to / from a storage facility. To remove this potential barrier to entry, it is recommended that DECC arrange for a Class Exemption from the Gas Transporter Licence to be put in place in respect of all delivery facilities connected to gas distribution networks.

Data requirements and transmission

The current industry processes for transmitting flow / calorific value were designed for large offtakes. The group should consider potential alternatives for transmitting data for the purposes of settlement.

The existing approach was clarified and has been captured in the Functional Specification. This involves the capture of considerable quantities of data and its transfer into their computer systems. This is designed to deliver compliance with the Gas (Calculation of Thermal Energy) Regulations. However, these Regulations were written on the basis that only GDNs own and operate CV measurement equipment. As such, it is not clear that the Regulations would apply to Biomethane producers under the approach envisaged by EMIB, whereby the producer owns and operates the CV measurement equipment. At an EMIB meeting, Ofgem had indicated that they would envisage biomethane entry points being "directed" sites in that letters of direction would be issued in accordance with the Regulations. Given the potential uncertainty about the applicability of the Regulations and Ofgem's consequent ability to issue letters of direction in respect of biomethane sites, the EMIB Chair wrote to Ofgem, on behalf of EMIB, to invite them to consider whether they would wish to promote an early change to the Regulations, and so provide increased certainty for the industry. A copy of this letter has been included as Appendix 7.

The group recommends that DECC should make the necessary amendments to the Gas (Calculation of Thermal Energy) Regulations to recognise non-GDN ownership of CV measurement equipment that is subject to Directions by Ofgem, in view of the earlier EMIB recommendation that entry facilities (including CV measuring equipment) should be provided as a competitive service

While believing that there is a case for the Regulations applying to biomethane sites, the group did not consider that the full range of information provision is appropriate. The present application of the Regulations may be regarded as over-specifying the amount of data that needs to be transferred to the GDNs' systems, such that the hardware / software required can, in practice, only be provided by one supplier and is arguably more expensive than necessary to protect customer interests. Estimates from potential suppliers have indicated that, compared to a specification that provides core data on a daily basis in a standard format, the current requirements may add as much as 20% to the cost of an entry facility. This is a substantial cost for which no clear benefit has been identified, and hence it is recommended that proportionate requirements are implemented as part of any change to the Regulations, recognising the low risk imposed by relatively small biomethane sites operating with an obligation to supply gas in line with the flow weighted average CV. Further detail is provided in Appendix 7.

The group therefore recommends that DECC should also make the necessary amendments to the Gas (Calculation of Thermal Energy) Regulations to reduce the need for transfer and storage of large amounts of data from the biomethane facility to the GT's systems on within day CV values and validation of instrument health, which causes unnecessary costs and prevents competition in the provision of data transfer facilities.

Appendix 1: Terms of Reference

Purpose

To provide a forum for informed debate on the potential barriers to the commercial development of biomethane projects within the energy market and the appropriate means of addressing such barriers, including but not limited to the following areas:

GDN connection policies - understand how the exiting connection policy operates and establish whether this introduces any barriers or uncertainty to facilitating connections to the grid.

Network capacity availability - Consider treatment of capacity for biomethane entry to GDN networks and consider areas for reform.

Technical standards for calorific value (CV) - Consider the implication for biogas injection in the context of the existing standards for biomethane CV measurement, and the associated governance regime.

Gas quality regulation - Develop an understanding of the current requirements and whether they remain fit for purpose for the injection of biogas.

Data requirements and transmission - The current industry processes for transmitting flow / calorific value were designed for large offtakes. The group should consider potential alternatives for transmitting data for the purposes of settlement.

Membership

By invitation. To include a range of stakeholders with an interest in biomethane injection issues and expertise or views which are directly relevant to the purpose of the group.

Meetings

Monthly or less – with the option of sub-groups being formed. Agendas, presentations and minutes will be published on the Joint Office of Gas Transporters website.

Secretariat

The Secretariat will be provided by the Joint Office of Gas Transporters.

Deliverables

The work of the group will be summarised in a report and published on the Joint Office of Gas Transporters website.

Appendix 2: Meeting Attendees

EMIB Meetings

Adam Baisley	Agri Energy
Alex Ross	Northern Gas Networks
Andrew Grigsby	Arup
Andrew Moore	Northumbrian Water
Chris Bielby	Scotia Gas Networks
Chris Phillips	CRS BIO
Dave Lander	Dave Lander Consulting
David Pickering	National Grid
Gareth Mills	Northern Gas Networks
Ian Gardner	Arup
James Lewis	Calor Gas Ltd
Joanna Ferguson	Northern Gas Networks
John Baldwin	CNG Services / REA
John Cornes	Atlas Copco
John Williams	Poyry
Jonah Anthony	DECC
Lesley Ferrando	Ofgem
Mark Bugler	British Gas
Matt Hindle	ADBA
Mike Berrisford (Secretary)	Joint Office of Gas Transporters
Pat Howe	SSE
Paul Holland	EffecTech
Peter Hardy	IGEM
Richard Fairholme	E.ON UK
Richard Lewis	Arup
Richard Pomeroy	Wales & West Utilities
Richard Street	Corona Energy
Roger Warren	Enzen Global
Stephen Skipp	Scotia Gas Networks
Steve Rowe	Ofgem
Steven Sherwood	Scotia Gas Networks
Stuart Bennett	Heat and Power Services
Tim Davis (Chair)	Joint Office of Gas Transporters
Tim Slaven	AMEC

Expert Group

Bob Fletcher (Secretary)	Joint Office of Gas Transporters
Brian Durber	EON UK
Chris Bielby	Scotia Gas Networks
Colin Stock	Wales & West Utilities
Dan Anderson	National Grid
Dave Lander	Dave Lander Consulting
David Pickering	National Grid
Helen Cuin	Joint Office of Gas Transporters
Iain Ward	REA/CNG Services

Ian Taylor	Northern Gas Networks
James Clarke	Skanska Utilities
Joanne Parker	Scotia Gas Networks
John Baldwin	CNG Services / REA
John Edwards	Wales & West Utilities
Jonathan Wisdom	RWE npower
Lesley Ferrando	Ofgem
Mike Berrisford (Secretary)	Joint Office of Gas Transporters
Olu Ajayi-Oyahire	IGEM
Paul Holland	EffecTech
Peter Hardy	IGEM
Richard Lewis	Arup
Richard Pomroy	Wales & West Utilities
Steve Armstrong	National Grid Distribution
Stephen Skipp	Scotia Gas Networks
Steve Howells	Scotia Gas Networks
Steve Rowe	Ofgem
Steven Sherwood	Scotia Gas Networks
Stuart Gibbons	National Grid Distribution
Tim Davis (Chair)	Joint Office of Gas Transporters
Will Guest	Northern Gas Networks

Appendix 3: Requirements for Integrated Biomethane to Grid Injection Facility Functional Specification

COVER NOTE

This functional specification has been prepared on behalf of, and approved by the following Gas Distribution Networks: National Grid, Northern Gas Networks, Scotia Gas Networks and Wales & West Utilities. It will be maintained and edited as necessary by the distribution networks jointly, following consultation with interested parties.

The functional specification sets out the broad requirements that must be complied with by any party seeking to inject biomethane into a gas distribution system. The specific requirements at any particular entry point will be specified with the Network Entry Agreement for that entry point. While the functional specification provides guidance on the requirements which are expected to apply in the majority of cases and be included in the relevant NEA, the Gas Distribution Networks necessarily reserve the right to carry out a risk assessment in each specific case in order to ensure that gas entering their gas distribution system is compliant with legislative requirements in the particular circumstances of each entry point.

Introduction

The UK Gas Industry wishes to facilitate the connection of renewable gas supplies into its gas distribution systems. The injection of biomethane into the gas grids in the UK is still in its early stages with just a small number of pilot projects underway. However the number of projects is expected to expand considerably now that the UK Renewable Heat Incentive has been announced, which provides a financial incentive to biogas producers to inject biomethane into the gas.

Existing biogas projects have employed bespoke designs of systems to inject biomethane into the gas grids, often based on equipment more commonly found in much larger scale natural gas systems. In order to facilitate connection therefore, it is essential that minimum functional requirements are set out so as to provide reassurance to GTs that such systems are fit for purpose and suitable to allow their legal obligations to be discharged, and to biomethane producers that such systems are appropriate to their smaller scale of operation.

1 Scope

This document sets out the overarching principles and minimum functional requirements to permit safe, efficient and fit-for purpose grid injection of biomethane. Ownership and responsibility for operation and maintenance of such "Biomethane-to-Grid" (BtG) facilities may rest with the GT, the biomethane producer or a combination of the two. Three models are envisaged and these are discussed in Section 5 in more detail.

2 References

2.1 Legislation

SI 1996 No. 551 - Gas Safety (Management) Regulations 1996

SI 1996 No. 439 - Gas (Calculation of Thermal Energy) Regulations 1996

SI 1997 No. 937 - Gas (Calculation of Thermal Energy) (Amendment) Regulations 1997

2.2 Design Standards

2.2.1 Institution of Gas Engineers and Managers

IGE/GM/8 - Non-domestic meter installations. Flow rate exceeding 6 $m^3 h^{-1}$ and inlet

pressure not exceeding 38 bar

IGE/TD/13 - Pressure regulating Installations for transmission and distribution systems.

IGE/SR/16 - Odorant systems for gas transmission and distribution

IGE/SR/25 - Hazardous areas classification of natural gas installations.

2.2.2 Gas Distribution networks

X/PM/G/17 - Management Procedure for the Management of New Works

X/PM/G/19 - Management Procedure for Application of Model Design Appraisals

X/PM/GQ/8 - Procedures for the Validation of Equipment Associated with the Calculation of Mass, Volume and Energy Flow Rate of Gas.

X/PM/PT/1 - Management Procedure for pressure testing of pipework, pipelines, small bore pipework and above ground austenitic stainless steel pipework.

Where X= T for National Grid standards, SGN for Northern Gas Networks standards, NGN for Scotia Gas Networks standards or WW for Wales and the West Utilities standards.

2.2.3 Wales and the West Utilities Network

T/PM/GL/5 - Management Procedure for Managing New Works, Modifications and Repairs

3 Definitions

The definitions applying to this specification are listed below.

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.
Biomethane to grid facility (BtG)	-	Facility to facilitate the injection of biomethane into gas distribution systems.
Delivery facility	-	The facility from which biomethane may be tendered for delivery at the LDZ System Entry Point.
Delivery Facility Operator (DFO)	-	The operator of the delivery facility.
Directed site	-	Site at which the GT 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.
Gas Transporter (GT)	-	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.
Liquefied Petroleum Gas (LPG)	-	Petroleum gas containing principally butane or propane stored and transported as a liquid under pressure.

4 Principles

4.1 Fundamental Principles

1) The legal obligations upon the GT in respect of gas introduced into its gas systems by a third party, as set out in the GS(M)R and Gas(COTE)R, are such that criminal liability cannot delegated to a third party. The GT may therefore wish to retain control of key aspects of some or all parts of the BtG facility including: ownership, design, operation and maintenance. The closure or the ROV shall be under the control of both the DFO and the GT. The opening of the ROV shall be under the sole control of the GT.
2) Gas not complying with the requirements of Part 1 of Schedule 3 of the GS(M)R shall not be injected into a gas grid unless an exemption has been granted by the Health and Safety Executive from a particular requirement. In such a situation the DFO and GT shall ensure that any requirements conditional to the granting of such an exemption are met.
3) Where the GT has been directed by Ofgem to determine calorific value, the facility and its operation shall be in accordance with the relevant Letter of Direction.
4) The costs associated with the capping of area calorific value in accordance with regulation 4A(1) of Gas (COTE) Regulations are disproportionate to the quantity of biomethane being injected. It is therefore essential that measures are taken to ensure that capping is avoided either by enrichment with LPG or, where technically and economically feasible, by blending with other gas being conveyed by the GT.

4.2 Measurement Risk Assessment

1) The DFO and GT shall participate in a measurement risk assessment in accordance with T/PM/GQ/8 to determine which parameters shall be monitored, the frequency of measurement and the speed of response of measurement system.
2) The recommended limit values shall be assessed by risk assessment.
3) The initial risk assessment shall set out those changes (e.g. change of feedstock to the Anaerobic Digester, equipment change, etc) that will require review of the risk assessment. In the event of one or more such changes, the risk assessment shall be reviewed. Where a particular parameter shows increased risk then a change in the monitoring scheme may be appropriate.

4.3 Provisions of the DFO

1) The DFO shall provide biomethane to the BtG facility that is compliant with the requirements of Part 1 of Schedule 3 of the GS(M)R, with the exception that it shall be unodorised.
2) Where the strategy for calorific value requires enrichment with LPG the DFO shall provide biomethane with a gross calorific value that equals or exceeds the target CV agreed with the GT on a daily basis.
3) Where the GT owns and operates the odorant injection equipment and the DFO owns and operates the metering equipment the DFO shall agree with the GT the interface between the metering and odorant injection equipment so as to permit control of odorant injection rate so as to achieve the required odorant concentration.
4) Where the DFO owns and operates the odorant injection equipment the DFO shall add odorant at the rate agreed with the GT. The GT may for operational reasons require injection at rates higher or lower than that generally required.
5) Where the DFO owns and operates the BtG facility the DFO shall also provide to the GT's telemetry system signals from the BtG facility of those parameters identified by risk assessment (see 4.2).
6) The DFO shall agree with the GT a local operating procedure for the management of non-compliant gas, including issue of TFA, advance notification of Remotely Operated Valve (ROV) shutdown and procedures for restoration of biomethane flow following ROV closure. This may or may not involve the installation of a diverter valve.

4.4 Provisions of the GT

1) The GT shall provide full details of the format of data for the telemetry interface so as to enable the DFO to procure suitable equipment to achieve appropriate repeat signals.
2) Where the GT owns and operates the odorant injection equipment and the DFO owns and operates the metering equipment the GT shall agree with the DFO the interface between the metering and odorant injection equipment so as to permit control of odorant injection rate so as to achieve the required odorant concentration.
3) Where the GT owns and operates the odorant injection equipment the GT shall add odorant to meet its obligations under the GS(M)R.
4) The GT shall agree with the DFO a local operating procedure for the management of non-compliant gas, including issue of TFA, advance notification of Remotely Operated Valve (ROV) shutdown and procedures for restoration of biomethane flow following ROV closure. This may or may not involve the installation of a diverter valve.

5 Asset ownership and operating and maintenance responsibility

5.1 Asset ownership models

Assets associated with the BtG facility are those that carry out the following functions:

a) Pressure reduction and control
b) Gas analysis for compliance monitoring
c) Metering
d) Odorant injection
e) FWACV functionality
f) Supervisory system

In addition, the following assets shall always be owned and operated by the GT:

g) The ROV
h) The telemetry unit

For the purposes of this functional specification, other functions required for production of biomethane are assumed to not be associated with the BtG facility. Such functions include:

i) Biogas clean-up
j) Enrichment with LPG and control of calorific value
k) The biomethane diverter valve, if arrangements have not been made with the GT for disposal of non-compliant gas that may have entered the BtG facility.
l) Compression, if biomethane is to be injected into distribution systems at pressures above 7 barg.

Three models of asset ownership are set out below. Note that the figures associated with the models are intended to show asset ownership and not the physical arrangement of equipment or devices associated with a particular functional block. In particular: the location of the ROV under Model 3; the location of compression; and the location of LPG enrichment with respect to the diverter valve may vary, depending on the requirements of individual GTs and arrangements agreed between the DFO and GT.

For the purposes of this functional specification it is assumed that the primary responsibility for operation and maintenance of any asset rests with the asset owner, although it is recognised that commercial arrangements may be put into place with third parties to delegate operation and maintenance.

5.2 Model 1 – The "minimum connection" model

In this model the GT owns only the ROV and the telemetry unit. All other assets associated with the BtG facility are owned by the DFO. Figure 1 shows the functional blocks and asset ownership for this model.

5.3 Model 2 – The "mixed connection" model

In this model, the GT owns, in addition to the ROV and telemetry unit, the odorant injection asset. All other assets associated with the BtG facility are owned by the DFO. Figure 2 shows the functional blocks and asset ownership for this model.

5.4 Model 3 – the "maximum connection model

In this model, the GT owns all of the assets associated with the BtG facility. No asset associated with the BtG facility is owned by the DFO. Figures 3 and 4 show the functional blocks and asset ownership for this model with the ROV located downstream of and upstream of the BtG facility, respectively..

6 <u>Functional Requirements</u>

6.1 Pressure Regulation and control

Pressure regulation and control is required to control pressure at the point of injection into the distribution system. As gas demand increases and pressure in the distribution system falls the pressure regulation and control system shall open the regulator to admit more biomethane. It is anticipated that demand will generally exceed biomethane flow and pressures in the distribution system will be so as to permit biomethane flow up to 100% of the agreed daily flowrate. The maximum flowrate of biomethane shall be controlled by assets upstream of the BtG facility and not by the BtG pressure regulation and control system. Demand in excess of biomethane flow will be satisfied by supplies of gas elsewhere in the distribution system. If demand should fall below the biomethane flow then the pressure regulation and control system shall close to reduce the biomethane flowing into the distribution system.

Pressure regulation and control shall be to IGE/TD/13.

6.2 Gas sampling and analysis

Gas sampling and analysis shall continuously or continually monitor 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 calorific value meets the minimum requirements agreed with the GT. A schedule of parameters that shall be monitored is given in Table 1.

Calorific value shall 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 shall comply with the requirements listed in an appropriate Letter of Approval from Ofgem.

The gas sample point for monitoring of parameters in Table 1 shall be located upstream of the BtG facility and upstream of the diverter valve, if installed by the DFO.

A facility shall be provided to permit representative spot samples of biomethane for laboratory analysis to be safely taken.

6.3 Remotely operated valve

An ROV valve shall be supplied, which shall be capable of manual remote or automatic closure in the event of variation in biomethane outside of the agreed conditions given in Table 1, failure of odorisation, or inability to provide sufficient blending where this is practiced (see 7.1). A more detailed description of trip and reset philosophy is given in the Gas Quality and Supervisory system functional block. The means of actuation of the ROV shall be the choice of the GT.

6.4 Metering

Metering systems shall be designed in according to the principles of IGE/GM/8 – Part 1.The metering system shall meet the accuracy requirements of Table 2 and shall be based on any principle of operation that is acknowledged as suitable for this application.

Volume conversion devices for conversion of metered volume to volume at reference conditions shall take account of pressure, temperature and compression factor. Systems employing a flow computer are preferred, but alternative systems may be acceptable provided that the overall accuracy requirements of Table 2 are met. Whatever solution is chosen, instantaneous flow and integrated daily volume shall be available for acquisition by the FWACV functionality system (see Section 6.6) and instantaneous flow shall be available to the Odorant Injection system to enable delivery of odorant at the required rate.

6.5 Odorant injection

The odorant injection system shall be designed in accordance with the principles of IGE/SR/16, with appropriate allowance for the small-scale of operation of BtG facilities.

The odorant injection system shall inject odorant in order to achieve - under normal circumstances - an odorant concentration of 6 mg/m^3 in the biomethane exiting the BtG facility. In some circumstances variation from this concentration may be required in order to achieve satisfactory odour intensity and so the system shall be designed to achieve odorant concentrations over the range 2-16 mg/m^3.

Three 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%)

c) Diluted odorant - Odorant NB 8 wt% (±2 wt%), hexane 92 wt% (±2wt%)

The odorant injection system shall employ a suitable liquid pump; evaporative or wick odorisers shall not be used.

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

The odorant tank at site shall be suitable for containing liquid odorant and be capable of being transported to facilitate re-filling by the appropriate service provider. Unodorised biomethane cannot be injected, so the design shall consider how the replacement tank is put into operation. The odorant supply shall be designed for around 6 months continuous site use at an odorant concentration of 6 mg/m^3 at maximum design flowrate.

An odour assessment test point suitable for use by trained rhinologists shall be installed downstream of the odorant injection point at a location agreed with the GT.

6.6 FWACV Functionality

The system shall deliver the functionality required for the FWACV regime, namely requirements set out in the Gas (COTE) Regulations and the conditions specified by both the Ofgem Letter of Direction for the BtG facility and the Letter of Approval for the chosen CV determination device. Conditions currently specified include the following:

1) 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 shall be such that only one value of each CV determination is acquired.

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

3) Initiation of daily calibration of CV determination device.

4) 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 of results of automated or manual tests in accordance with Regulation 6(e) of the Gas (COTE) Regulations.

5) 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 Good if the CV determination device is operating within agreed limits) and averaging of only those records that are Good and for which gas is flowing past the sample point. In addition a flag shall be stored indicating whether the resulting daily average CV is Valid (i.e. the maximum time between Good records is less than 8 hours). Gross CV values during calibration or tests of apparatus and equipment shall not be included for averaging.

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

7) In addition to local storage of individual data acquired, appropriate means of secure transfer of data to the High Pressure Metering Information System (HPMIS) owned and operated by the GT. HPMIS currently accepts data as CSV files with appropriate check sum to ensure corrupted data is identifiable and not accepted. A list of files and file structure is provided in Appendix A.

FWACV functionality may vary if alternatives to the CV determination devices currently approved by Ofgem become available.

Any software and hardware solutions are acceptable provided they deliver the required FWACV functionality, but the GT will require demonstration that the required functionality has been delivered. In addition Ofgem may require testing and approval of some parts of or all of such software and hardware by their service provider.

6.7 Gas quality and supervisory system

The Gas Quality and Supervisory system shall monitor biomethane quality signals from the BtG facility instrumentation, the remote monitoring unit instrumentation and the delivery facility instrumentation. Monitoring shall be continuous or continual and provide confirmation that the biomethane injected into the grid is compliant with the requirements of Table 1 or any other parameters agreed by risk assessment (see 4.2). If blending is practiced (see 7.1) monitoring shall also provide confirmation that the biomethane-gas blend is compliant with the requirements of Table 1 for oxygen content and/or CV, as appropriate.

In the event of an excursion in any of the parameters in Table 1 or any other parameters agreed by risk assessment (see 4.2) the trip system shall initiate closure of the ROV and prevent further grid injection of biomethane.

The limit values in the parameters of Table 1 are indicative and site-specific values shall be agreed during design approval and may be subject to review if risk assessment confirms such a requirement (see 4.2). All alarms and trips shall therefore be configurable.

If closure of the ROV has been initiated because of non-compliance with the parameters in Table 1 or any other parameters agreed by risk assessment (see 4.2), then its subsequent opening shall be under the sole control of the GT.

7 Variations

7.1 Remote monitoring unit

Monitoring of gas quality at a location remote from the BtG facility may be required if comingling of biomethane with gas in the distribution system is practised. Two scenarios are envisaged where comingling may be carried out:

a) Where monitoring of oxygen content of the comingled 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 (see 7.1));

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

The remote monitoring unit shall therefore contain a remote oxygen monitoring meter and/or a CV determination device approved by Ofgem as in Section 6.2, together with telemetry to send the measured values of oxygen content and/or CV of the comingled gas back to the main BtG facility or the GT's telemetry unit as appropriate.

8 Design approval

8.1 Assets owned by the GT

Design approval for all assets owned by the GT shall be managed in accordance with T/PM/G/17. Note that if a valid model design appraisal for the BtG facility is available then site specific design approval within T/PM/G/17 by application of T/PM/G/19 is acceptable.

8.2 Assets owned by the DFO

For those assets owned by the DFO the GT shall be afforded the opportunity to review the design of interfaces to assets owned by the GT.

9 Testing

9.1 Assets owned by the GT

Pressure testing of all pressure containing components and systems shall be carried out in accordance with T/PM/PT/1. Testing of electrical and instrument systems and equipment shall be carried out in accordance with BS 7671 and BS EN 60079-14.

9.2 Assets owned by the DFO

All pressure containing components and systems shall be shall be pressure tested and declared safe to commission by the DFO. Testing of electrical and instrument systems and equipment shall be carried out in accordance with BS 7671 and BS EN 60079-14.

10 Commissioning and initial validation

10.1 General requirements

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

A written commissioning procedure shall be agreed and shall take into account relevant Permit to Work procedures.

Initial validation shall be carried out in order to demonstrate the accuracy of the measurement system complies with the requirements of Table 2. Suitable systems, software or procedures shall be provided or agreed to ensure that compliance can be demonstrated.

10.2 Assets owned by the GT

Following satisfactory commissioning, validation of the flow and gas quality measurement system shall be carried out in accordance with the relevant parts of T/PR/ME/2 or an alternative documented procedure if appropriate.

10.3 Assets owned by the DFO

Following satisfactory commissioning, validation of the flow and gas quality measurement system shall be carried out in accordance with a documented procedure agreed with the GT.

Table 1: Parameters to be monitored and indicative limits to be applied

Parameter	Units	low limit	high limit
Delivery temperature	^oC	(see note 1)	(see note 1)
Delivery pressure	barg	(see note 1)	(see note 1)
Wobbe index	MJ/m^3	47.2	51.41
Incomplete combustion factor	-	not applicable	0.48
Sooting index	-	not applicable	0.60
Gross calorific value	MJ/m^3	(see note 2)	(see note 2)
Carbon dioxide	mol%	not applicable	2.5
H_2S	mg/m^3	not applicable	5
Water dew temperature (see note 3)	^oC	not applicable	-10
Odorant injection rate	mg/m^3	(see note 4)	(see note 4)
Odorant injection pump operation (see note 5)	-	not applicable	not applicable
Odorant tank level	-	(see note 6)	not applicable

Notes:

1. Limits for delivery temperature and pressure to be agreed during design review.

2. Targets for calorific value will be agreed during design review.

3. Water dew temperature to be calculated using the LRS equation of state at a pressure of 7 barg (for injection into below 7 barg systems) or at the highest anticipated pressure (for injection into above 7 barg systems).

4. Odorant injection rate (typically 6 mg/m^3) and high/low limits to be agreed during design review.

5. Confirmation is required that the odorant pump is operating.

6. Low level on odorant tank shall trigger alarm and at extra low level shall initiate closure of the process shut down valve.

Table 2: Accuracy requirements for metering system

Design daily volume	MPB (Note 1)		MPE (Note 2)	
	Daily volume	Daily energy	Daily volume	Daily energy
Less than 250,000 m^3	0.90%	1.0%	2.9%	3.0%
Greater than 250,000 m^3	0.09%	0.10%	1.0%	1.1%

Note 1: Compliance with MPB shall be deemed if |mean error| ≤MPB

Note 2: Compliance with MPE shall be deemed if |mean error| + U(mean error) ≤MPE

Note 3: Subject to agreement with Ofgem that the above accuracy requirements are "requisite to the calculation of daily calorific value" (see regulation 3.(3) (b) of the Gas (COTE) Regulations)

Figure 1: Asset ownership under Model 1 ("Minimum Connection")

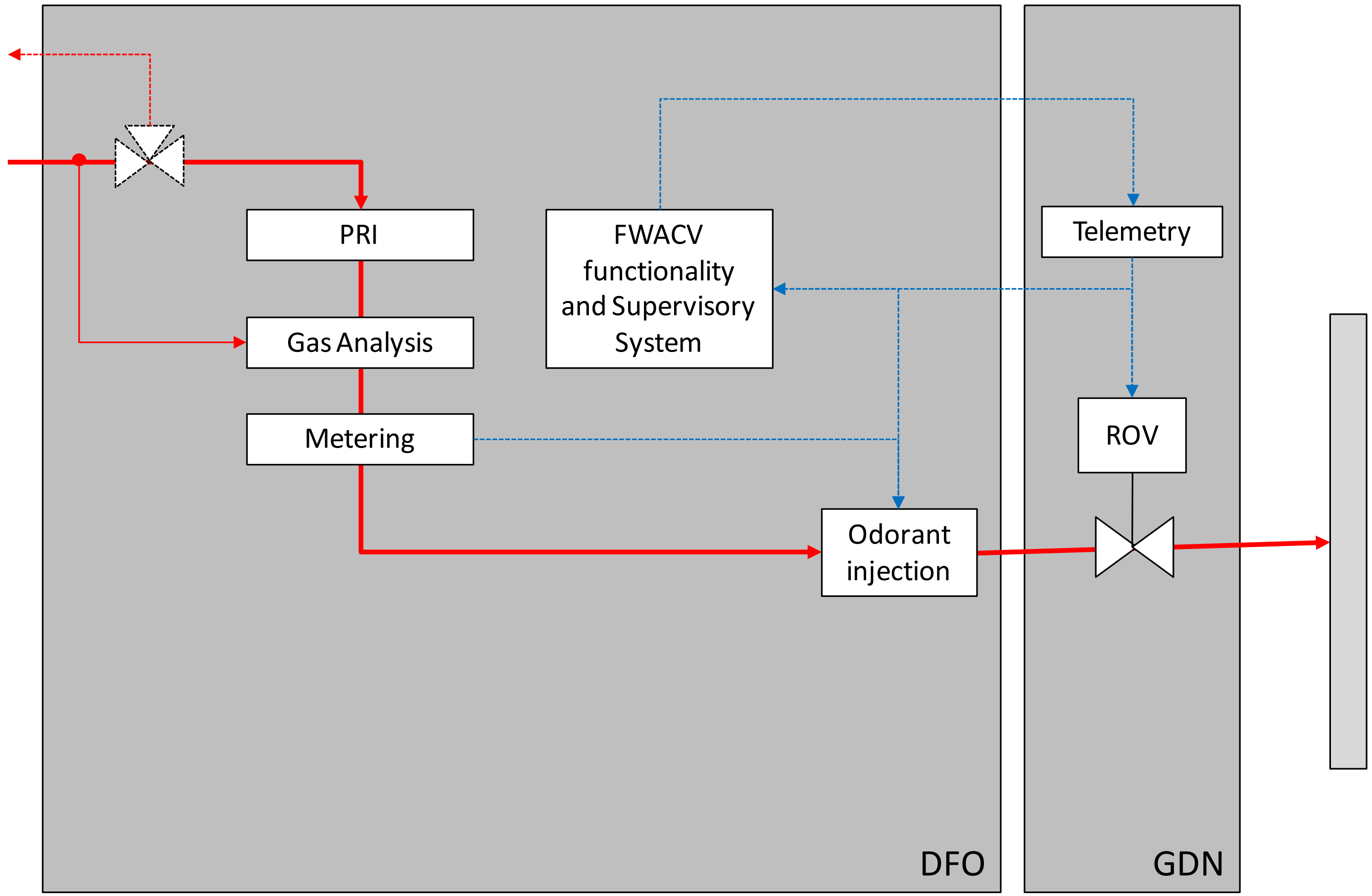


Figure 2: Asset ownership under Model 2 ("Mixed Connection")

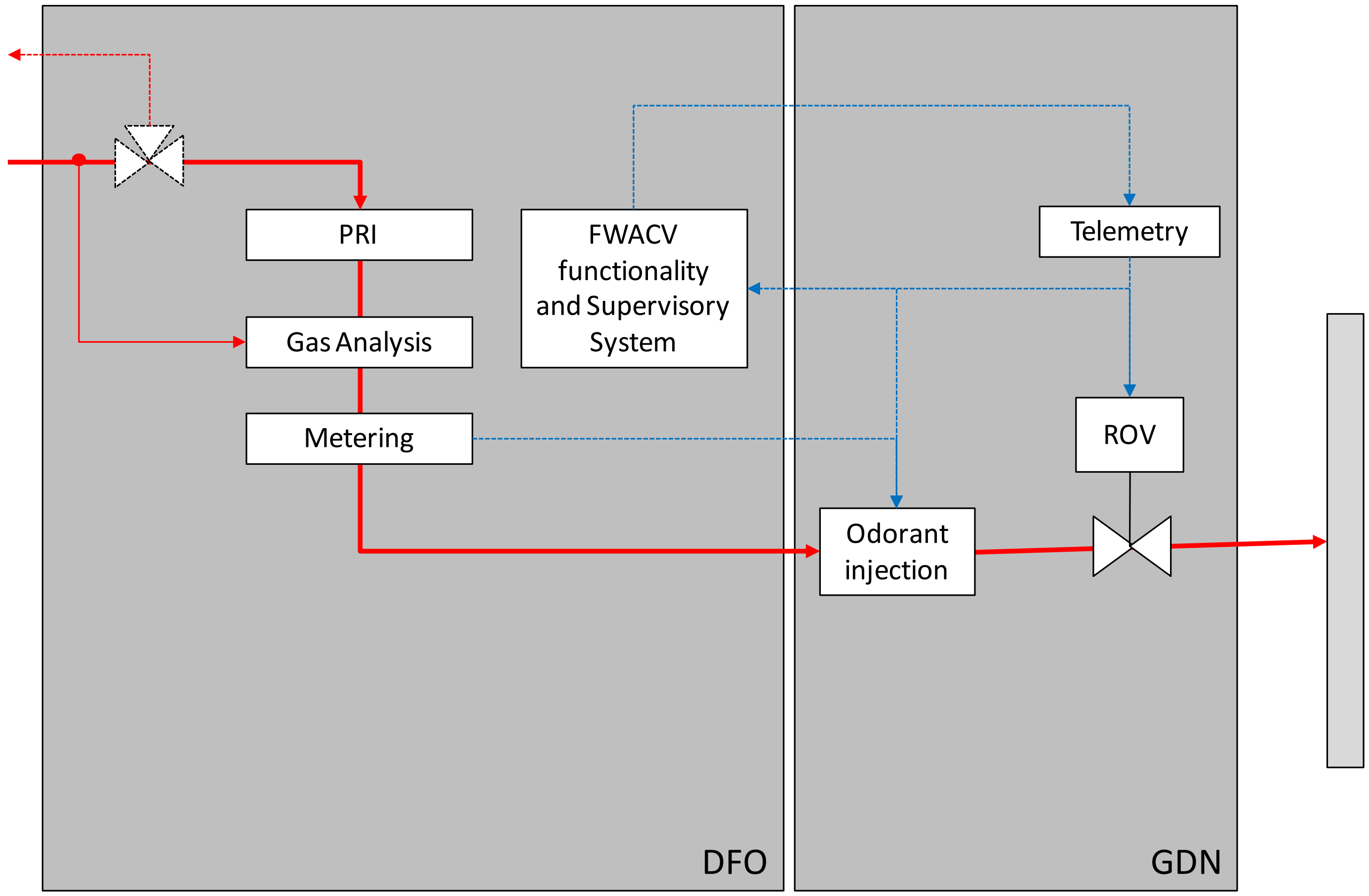


Figure 3: Asset ownership under Model 3A ("Maximum Connection – ROV downstream")

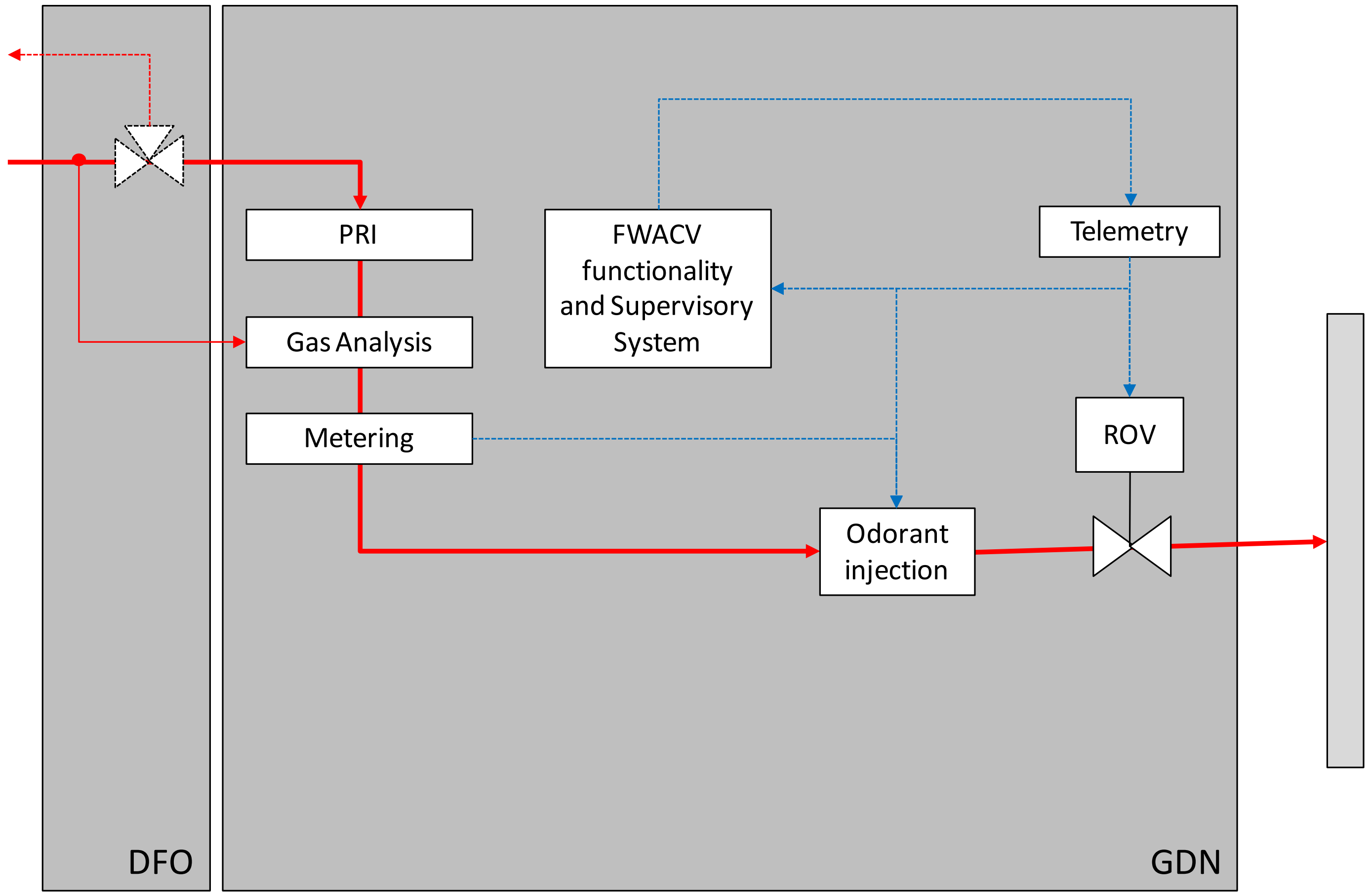
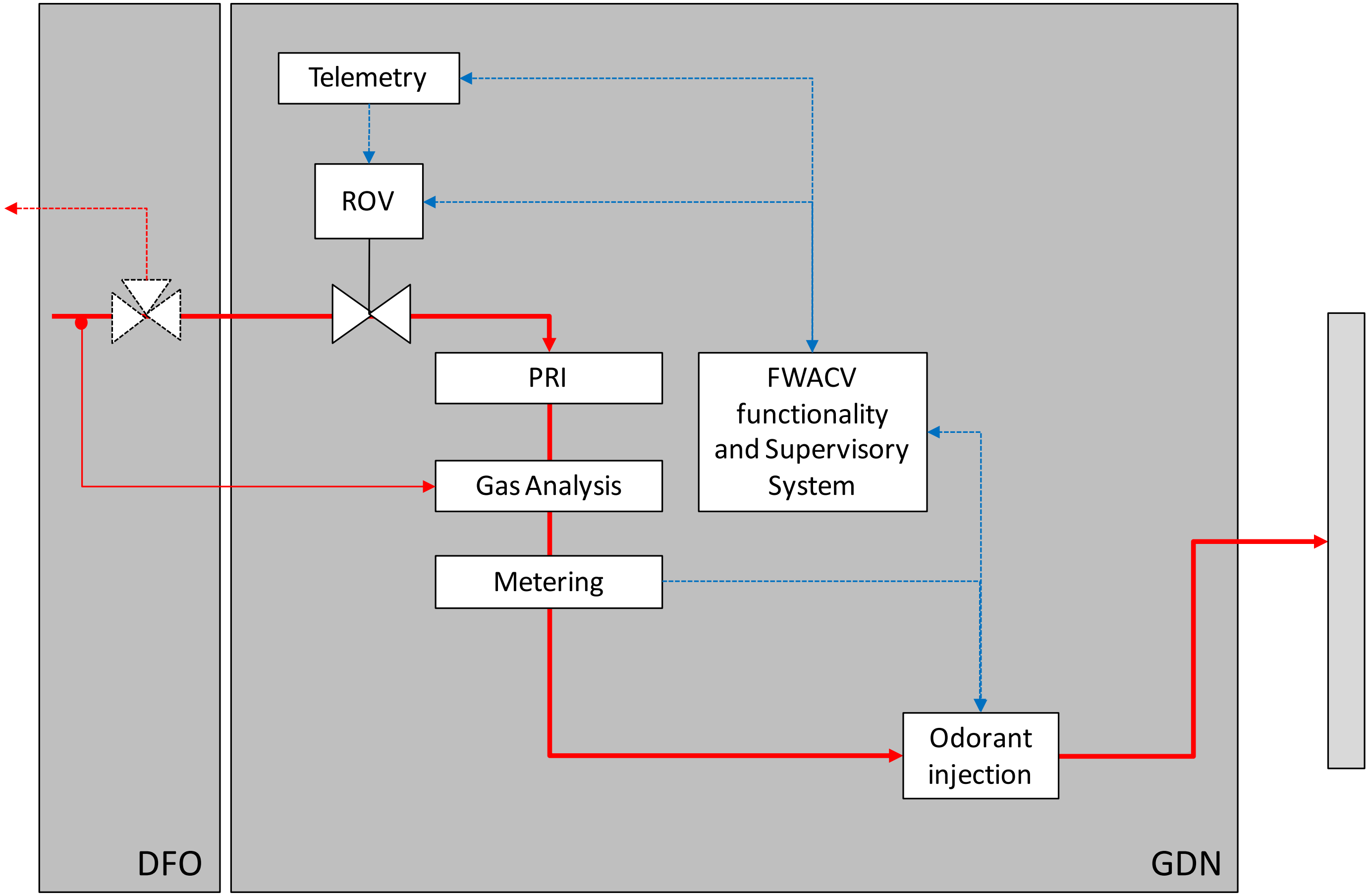


Figure 4: Asset ownership under Model 3B ("Maximum Connection – ROV upstream")



Appendix a
Data Files and File Structure

INTRODUCTION

HPMIS is an Oracle database located at a central server and forms the basis by which many of the Gas Transporter obligations under the Gas (Calculation of Thermal Energy) Regulations can be managed. Data is imported as CSV files with a fixed data structure that must be adhered to if data is to be located correctly into the database.

The following Table lists the file naming and format for the daily average CV file to be returned from the BtG facility.

Because it has not been established whether additional files need to be returned from the BtG facility, I have limited the Appendix to the "EOD" file. Should additional files need to be added then this can be done in a further revision. An alternative would be to agree a (single) dedicated file format for BtG facilities that satisfies Ofgem in terms of Gas Transporter's obligations and develop a suitable script for HPMIS to transfer data. Obviously this would have cost implications for the GDNs.

Details of the checksum at the end of the file will need to be supplied once the principles have been agreed, however it is probably not appropriate to include it at this stage.

The existing approved instruments are multi-stream and have between 3 and 5 gas streams: Stream 1 (calibration gas); Stream 2 (Gas Examiners' test gas) and Streams 3-5 (gas for analysis). For single-stream instruments that have neither calibration nor GE test gases, the extension ".ST3" is recommended for consistency.

HPMIS file name: Hsite.AByymmdd.Y0n.		
This file contains the results of the end of day averaging process and is generated at the end of the Gas Day (currently 06:00, although it is recommended that this is configurable). The stream number is indicated by "n".		
Line	Structure	Example

HPMIS file name: Hsite.AByymmdd.Y0n.		
This file contains the results of the end of day averaging process and is generated at the end of the Gas Day (currently 06:00, although it is recommended that this is configurable). The stream number is indicated by "n".		
Line	Structure	Example
1:	Header comprising the Instrument number and location description followed by the name and version number of the software generating the data. (Under current arrangements the software that performs the averaging process is approved by Ofgem, so software name and version number must be included.)	"Instrument1234 at location: EODAVE v3.7"
2:	Time and date of the last record used in the file that contains individual CV data.	"06:02-20/01/2012"
3:	Stream number	3
4:	Blank (intentional)	-
5:	Indication if the average CV is valid (Y,N, or X)	Y
6:	Number of records used in the averaging process.	98
7:	Average CV (rounded to 1 dp using the normal rules of rounding).	38.5
8:	Blank? (Average RD)	0.6324
9:	Blank? (Number of records used in tracker averaging)	-
10:	Blank? (Tracker CV)	-
11:	Blank? (Tracker RD)	-
12:	Blank? (attribution flag)	-
13:	Blank (intentional)	-

HPMIS file name: Hsite.AByymmdd.Y0n.		
This file contains the results of the end of day averaging process and is generated at the end of the Gas Day (currently 06:00, although it is recommended that this is configurable). The stream number is indicated by "n".		
Line	Structure	Example
14:	Blank? (Total number of non-zero flow records in the file containing data for averaging)	-
15:	Blank? (24hr integrated flow)	-
16:	Blank? (24 hr integrated energy)	-
17:	Blank? (Sample gas minimum pressure and temperature)	-
18:	Blank? (Calibration gas pressure at end and temperature at calibration)	-
19:	Blank? (test gas end pressure and minimum temperature)	-
20:	Blank? (the two carrier gas cylinder pressures at end)	-
21:	Name of file containing the data that was averaged.	C:\DATA\DATA0101.ST3
22:	Configuration parameters for the for the averaging software: end of day time, loss of record time (hrs), stream sequence, FWACV flag, streams with a flow computer and the no flow time (hrs)	"06:00",8,"3","Y","3",0
23:	File terminator: @ plus 6 character checksum.	@XXXXXX

Appendix 4: ENA Capacity Position Paper

Capacity for distributed gas entry

Gas Act obligation
Gas Act section 9 obliges transporters to develop an economic and efficient system.
Standard Special Condition D12 3b requires the DN to offer the maximum flow rate that is ava
from time to time.

Current method of capacity analysis
The DNs will analyse capacity using the following principles.

Analyse available capacity on day of minimum demand using network analysis models assum appropriate proportion of peak day flow for that network and pressure tier. We would use moc the period up to the end of the next Forecast Year 1. A check will be performed to ensure that capacity is not reliant on a few large loads. Relying on large loads is not a tenable strategy as can be no guarantee that the demand will always match the supply for example due to short t long term plant shutdowns.

- Where there is sufficient capacity the available capacity will be offered
- Where there is insufficient capacity to meet the entrant's request, the entrant may ask to consider other measures to provide the requested capacity. The entrant would ne pay for the feasibility study to determine what options are available and any measur taken to provide capacity which would be chargeable to the connecting party

Methods of providing increased network capacity
Networks can provide increased entry capacity by the following methods which may not be av in all circumstances.

- Changing current network dynamics
- Linking two networks
- Within network compression

<u>Changing current network dynamics</u>
This allows the distributed gas injection to be the "lead" and to back out the gas from the NTS. are cost implications for on going analysis, control centres and operations. This solution may detrimentally affect pressures at times of high demand.

<u>Linking two networks</u>
In this case two adjacent networks could be linked to provide a larger network to take the avai gas. Each case would need to be examined on a case by case basis and there is likely to be

<u>Within network compression</u>
This might be possible in the future if the within-network compression IFI project produces pos results. A compressor would be installed to pump gas up to a higher pressure level at times o demand on the network to which the distributed gas source is connected.

Changes in available entry capacity after the connection is made
If the exit demand on the local network to which the entrant is connected reduces at some po the future then in some cases the entrant may not be able to inject gas. If it is possible to rein the network to allow the entrant to continue to inject gas then either

- The entrant pays for the reinforcement
- The reinforcement is treated as general reinforcement

<u>Entrant pays for the reinforcement</u>
In this case the entrant takes on an open ended liability to pay for reinforcement for the life of t plant. This would be inconsistent with the approach taken for Exit demands where a gradual ir in demand leads to general reinforcement. If this approach is adopted it seems likely that the r of distributed gas schemes implemented will reduce as only those where there is plenty of cap will be viable. This solution is likely to become complex if two or more entrants share inject ga the same network.

<u>The reinforcement is treated as general reinforcement</u>
This seems to be the only realistic option. This would be consistent with the treatment of exit.

Proposal
Following the successful connection of a distributed gas connection any future reinforcement of the Network to provide the contracted capacity should be treated as general reinforcement and included within the DN's RAV.

General reinforcement to support entry would be defined as reinforcement caused by changes in exit demand that means that there is no longer sufficient entry capacity available to enable gas entrants to continue to inject gas at the rate agreed at the time of connection and for which there was sufficient entry capacity at the time of connection over the DN'sTs planning horizon (up to the end of Forecast Year 1).

Appendix 5: Accuracy Of CV Determination Systems For Calculation Of FWACV

Appendix 6: Specification Of Water Dew Temperature Of Biomethane Injected Into Gas Distribution Systems

Appendix 7: Gas (Calculation of Thermal Energy) Regulations

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* Calls will be recorded and may be monitored

20 April 2012

Dear Steve,

Recommendations from EMIB Expert Group relating to Gas (Calculation of Thermal Energy) Regulations and data transfer requirements for small entry flows

We had a useful discussion at the EMIB Expert Group on 16th April relating to the energy measurement and data transfer requirements for small entry flows which are driven by the requirements of the G(COTE) Regulations and the Ofgem Letters of Direction / Letters of Approval. As a result of the discussion we agreed it would be very helpful if you could initiate a number of actions; some relating to recommendations for changes to the Regulations themselves (which we recognise would need to be considered / sponsored by DECC and would take some time to implement), and some relating to Letters of Direction / Approval which would be within Ofgem's power (possibly following consultation) to implement in a shorter timescale.

We believe there needs to be urgent action on the following high level points:

- As the Regulations apply only to Gas Transporters, if Ofgem intends that CV measurement at system entry should continue to be subject to Directions this is not compatible with third party ownership of equipment. It would not make economic sense to install two assemblies of CV measuring equipment, but as this equipment makes up a large proportion of the grid injection facilities it would effectively limit ownership of such facilities to GTs, which was not the intention of EMIB. Therefore the Regulations need to be changed,
- The current requirements in the Regulations and Letters of Direction / Approval imply the need for transfer and storage of

large amounts of data from the site to the GT's systems on within day CV values and validation of instrument health, which causes unnecessary costs and prevents competition in the provision of data transfer facilities. These requirements should be changed to reduce costs and allow competition.

In relation to costs / competition, preliminary enquiries have indicated that if some of the current required functionality could be relaxed in the case of small entry flows of less than say 250,000 m3 / day, this could lead to cost savings of between £25 – 50k per installation (up to 20% of the costs of the equipment), thereby reducing barriers to entry to biomethane and other sources of distributed gas.

The detailed recommendations are as follows:

Gas (Calculation of Thermal Energy) Regulations 1996 (and the 1997 Amendments)

1. Currently there is a requirement in Regulation 6(c) for **the gas transporter** to "provide and maintain such … apparatus and equipment for the purpose of making such determinations as the Director may direct". We believe that this requirement is potentially at odds with the agreement at EMIB by the Gas Distribution Networks that third parties such as biomethane producers should be allowed to own and operate energy measurement equipment at system entry. We considered whether "provide and maintain" could be construed to mean "procure others to provide and maintain", but were concerned that this was at best open to legal challenge.

   The assumption that it is the gas transporter that is always responsible for measurement and calculation of CV runs throughout the Regulations (see, e.g. 4(3) and 4A(7)), and our view was that the Regulations should recognise a distinction between the responsibility for site measurement of CV at an input point (which in future could be the responsibility of a biomethane producer) and the responsibility of calculating the flow weighted average CV (which would stay with the GT)

   Therefore we would be grateful if you would raise the profile of this issue with DECC. The options for solving the problem appear to be:
   a. Do nothing: this would not support the EMIB agreement on third party ownership of grid injection equipment, as volume and CV measurement form a large part of such equipment
   b. Obtain a legal opinion that "provide and maintain" may be interpreted as "procure the provision and maintenance of" in relation to energy measurement equipment: this would support third party ownership, but might not provide sufficient certainty for project developers against the risk of potential future regulatory action
   c. Change the Regulations to accommodate third party ownership of energy measurement equipment: **this is the recommended option**, but the EMIB group recognised that it was not a short-term solution
   d. In the short term obtain an exemption from the Regulations from DECC to allow third party ownership: this could be an interim solution in the period leading up to a change in the Regulations.

2. There is a requirement in the Regulations for a gas transporter (which would need to be amended to owner of the equipment in the light of the above) to carry out tests on CV measurement

equipment at least every 35 days and to notify the results of such tests to the Director within 7 days of the end of the calendar month in which the tests were completed (Regulation 6(e) and (f)). We proposed that the requirement to notify the results of **all** tests to Ofgem was unduly onerous, and that, whilst their should continue to be a requirement for tests to be carried out, **it should be sufficient to report within 7 days only those incidences where the equipment was outside its permitted tolerance** (which, if other EMIB recommendations are accepted, would be +/-0.5 MJ/m3).

Finally in relation to Regulation 6 we noted that the requirements in (d) and (g) to make available for inspection by the public and by licence holders (shippers) the results of CV determinations or tests was redundant and pure “red tape”, as, to our knowledge, the opportunity for inspection of these results has never been exercised. Therefore **these provisions should be recommended for removal and replaced by an obligation on the equipment owner to store the data (on site) for a particular time and make it available on request.**

The same comment applies in relation to Regulation 5(a) and (c), and Regulation 13, where the requirements for the GT to make CV / testing data available for inspection, or to send calculations of daily CVs to owners / occupiers has never, to our knowledge, been invoked. **These provisions of the Regulations could also usefully be removed and replaced by a similar obligation for on site data storage / retrieval.**

The above recommendations for changes to the Regulations, if implemented, would have the effect of reducing the requirement for data items to be communicated back from individual sites into the computer systems of the GTs thus simplifying the data transfer process with an associated benefit in terms of cost reduction. The intention would be that, rather than communicating vast amounts of (largely irrelevant) CV-related data to the computer systems of the GT and storing such data centrally, it would instead be held securely in the equipment at the site, and would be available for retrieval by the owner of the equipment (biomethane producer or GT as applicable) in the (unlikely) event that it was required for inspection. In this regard, any requirements in the regulations for communication of data to Ofgem (or any other non-GT party) should apply to the owner of the equipment rather than to the GT.

Letters of Direction / Approval

1. Current Letters of Direction require that the average calorific value for each gas day shall be determined by aggregating the values of discrete measurements of calorific value of the gas at regular intervals, not exceeding one hour, during the gas day. The averaging is currently carried out by the end of day averaging software. Uploading of individual CV/flow data is currently carried out to permit re-constitution of data in the case of metering errors and to permit details of how daily average CV was calculated.

   We agreed that, at least in relation to small gas inputs of less than say 250,000 m3 / day, daily average CV and daily volume should continue to be calculated at site and this minimum dataset should be sent back to the GT (plus a flag indicating validity of the CV. Data transmission would continue to use the existing CSV format, so whilst the process would be simplified in terms of data volumes there would be no need for changes in the existing systems. The existing requirements for the calculation of average

CV to exclude CV values which are invalid / associated with zero flow would remain, but the records of excluded values would be stored locally rather than delivered into the GT's systems.

2. We had a lengthy discussion on how the current requirement in Regulations 4(3) and 4A(7) to use alternative CV determination methods in cases where the "apparatus … fails to determines accurately, or at all, calorific values for a continuous period exceeding eight hours in any gas day…" might be met, where such measurements were not being continuously loaded into the GT's systems. We came to the conclusion that as it would not be possible for a third party equipment owner to rely on calculated values of CV to be provided by the GT (this is an offline process within NG Transmission) the only alternative appeared to be for **arrangements to be put in place to shut off the flow of gas if it appeared likely that the eight hour inaccuracy criterion might be breached.** For example, the DFO could be required to shut off after [seven] hours, with the backstop of the GT having the right to operate the ROV before the eight hour condition came into play.

3. We also noted that some of the requirements in the current Letters of Direction / Approval relate closely to the existing approved instrument (the Danalyser); e.g. the demonstration that the calibration gas employed is suitable during the 35 day test. It is possible that a different instrument may not have such requirements (or might have different ones) and so would need to be developed at the time of approval of the instrument. For this reason it is difficult to fully specify which data and files are required for upload to HPMIS to an agreed format until an alternative instrument is approved. **However, if it were possible to store much of the data locally and to upload only end of day volumes and CVs into the GT's systems, then much of this data transfer complexity could be avoided.**

Information security issue

You should also be aware of a further issue in relation to security aspects of data transfer. National Grid's IS department has identified a possible IT security risk issue in relation to data transfer from third-party owned equipment into GDN's SCADA by means of the current ethernet connectivity and HPMIS systems by means of the current RemoteWare server / ISDN connectivity. NG IS has recognised that the IP connectivity between the systems could provide unauthorised access to the GDN's Critical National Infrastructure (Distribution Network Control Centre systems) and to the GDN's business networks, and so it is essential to develop a solution for business to business data transfer that mitigates this risk. NG IS is currently scoping out possible solutions to this problem, but developing an alternative to the current continuous data transfer link into HPMIS (e.g. transfer of end of day readings only) could be helpful in this regard.

In conclusion, we would appreciate your support in relation to the proposals outlined above. In particular we invite you to progress these issues with DECC where appropriate, and to consider changes to letters of Direction / Approval to accommodate simplification of CV measurement for small input flows, with consequential benefits in relation to costs and competition in provision.

We note that there are two biomethane projects currently being built on the pre EMIB basis of the GDN providing entry facilities (with some IFI funding). However, a number of projects are aiming for approval in the next six months, for completion by summer 2013, and they have been progressing on the basis of the biomethane producer providing the entry facilities. Hence this gives a degree of urgency to addressing the G(COTE) point.

Please give these matters your urgent consideration; we would we would appreciate your feedback prior to finalising the recommendations for inclusion in the final EMIB report.

Yours sincerely

Tim Davis
On Behalf of EMIB Expert Group