

Gas Network Innovation Competition Screening Submission Pro-forma

Notes on completion			
<p>Before completing this form, please refer to the Gas Network Innovation Competition (NIC) Governance Document, which details all of the information that you are required to provide.</p> <p>Please use Verdana size 10 font in your submission. The text entry areas are suggestions and the size of each text area can be altered if you need to provide more information in one section and less in another. In all cases the full-completed submission should not exceed 11 pages in total.</p> <p>Ofgem will publish all the information contained within the Screening submission.</p>			
Funding Licensee			
National Grid Gas Distribution			
Network Licence Project Partners			
DNV GL, Northern Gas Networks			
Funding Licensee area <i>(or where the licensee does not operate in a specific area the geographic location(s) of the Project)</i>			
National Grid Gas Distribution			
Project title			
Future Billing Methodology			
Project Summary			
<i>The Licensee must provide an approximate Project start and end date.</i>			
<p>The UK has been reliant on North Sea Gas since the 1970s for its natural gas supply with regulations and commercial billing regimes being designed for this stable and reliable source of gas to the UK. The natural gas supply market is changing at a pace, with Liquefied Natural Gas (LNG) making up circa 10% of our supply and potentially 35 TWh (10% of domestic usage) of biomethane and bio-substitute natural gas being distributed across gas networks by 2030. These new and different sources of gas compliant with the Gas Safety (Management) Regulations {GS(M)R} are constrained by the current commercial/operational arrangements. NGGD is concerned that these commercial issues, rather than gas safety, preclude the injection of volumes of gas that are constrained by the existing Flow Weighted Average Calorific Value (FWACV) billing regime operated by the industry. Producers of low calorific value (CV) gas are required to enrich their volumes of "green" GS(M)R compliant gas with propane to meet the target Local Distribution Zone daily CV target defined by the FWACV billing regime. The objective of this project is to develop and implement a new billing process that will ensure that the entry of all GS(M)R compliant gases into the system and to ensure customers are billed for the energy value of the gas. The project aims to build on a recent NIA project, recommend a billing methodology that reflects the energy delivered to consumers and that is fairer to stakeholders and work with industry stakeholders to implement the solution.</p>			
Estimated Project funding			
<i>The Licensee must provide an approximate figure of the total cost of the project and the NIC funding it is applying for.</i>			
Total cost of Project	£4,730,000	NIC funding requested	£4,300,000
Cross Sector Projects only: Requested funding from Electricity NIC or NIA?	<i>If yes, please specify</i>		
	None requested		

Problem(s)

The Licensee must provide a narrative which explains the Problem(s) which the Project is seeking to address.

Each LDZ has a number of entry points with gases from different sources and with different energy content. The FWACV is calculated from the flows and CVs of all the gas entering the LDZ. As a consumer protection measure, the FWACV used for customer billing cannot be more than 1 MJ/m³ above the lowest CV entering the charging area – this is known as the CV cap. Where new embedded gas supplies are connected to the network, gas transporters currently impose a minimum daily average CV to prevent the 1 MJ/m³ CV cap being imposed. Propane is added to enrich the gas to meet the target CV. This is adding carbon to unconventional “green” gases which is counter-productive. Note that an insignificant volume of low CV gas can cap an entire LDZ. Biomethane plants, for example, are designed to operate at a constant flow into the network and the geographical area supplied varies with the network demand. At high demand the gas can be absorbed in a smaller area than when the demand is lower and as a consequence the number of customers supplied from the low CV source will be greater in the summer than in the winter. Unconventional gas suppliers cannot sustain the addition of propane as the flow rates increase. The cost of propanation equals the cost of shrinkage (caused by the CV cap) when 19% of the gas entering the network is low CV - with shale gas this is a possibility. About 0.27% of the gas injected into the GB gas network is low CV gas and the cost of propanation is over £2m/year – this is also eventually borne by the consumer through the Renewable Heat Incentive. This money could be spent on investigating a more equitable billing system.

The CV of the gas delivered to consumers is dependent on the range of the CVs delivered to the LDZ and the consumers’ location relative to the supply inputs. Consumers close to a high CV entry point are likely to receive high CV gas and meter a lower volume for a fixed energy requirement leading to lower bills and vice versa. However, consumers are not billed on the CV delivered to their property but on the FWACV of the LDZ. Under the current FWACV regime, the variation in consumers’ bills is about £20 per year for the same energy requirement. If the CV cap is invoked, the variation in bills is about £42 per year for the same energy requirement. Under the FWACV and capped CV schemes, consumers receiving the low CV gas always over pay and all other consumers underpay. There is an inherent cross-subsidy between customers.

In principle, there should not be barriers to the entry of gas that is safe for consumers to use and that conforms to the current, or any future, GS(M)R limits. The current billing system restricts entry, on purely commercial (rather than consumer safety) grounds, against low CV supplies such as “green” gases like biomethane, carbon-free hydrogen injection into natural gas (Power-to-Gas projects) and high-volume indigenous supplies like shale.

Method(s)

The Licensee should describe the Method(s) which are being demonstrated or developed. The Licensee must outline how the Method(s) could solve the Problem. The type of Method should be identified where possible eg technical, commercial etc.

It is proposed that the project will be delivered in four work packs:

- 1) Consideration of alternatives for the allocation of CV values to end users supported by three field trials of increasing complexity:
 - a) A low volume small biomethane supply into a simple low pressure network
 - b) Large volume, low calorific value supply
 - c) Large volume biomethane supply (eg, Mimworth) into a complex network
- 2) Investigate the possibility of providing an up-to-date calorific value to Smart Meters to enable consumers to better understand gas energy use
- 3) Recommend a billing methodology that delivers a solution that more closely reflects the energy delivered at a meter
- 4) The future billing methodology project will be broken into a series of delivery milestones to review progress, assess delivery and track timescales.

Work Pack 1

A range of methodologies for CV measurement and allocation to Meter Point Reference Numbers (MPRNs) may be studied by undertaking a cost-based analysis. Network modelling, data capture and an analysis strategy will be required to deliver the outputs. These studies will be underpinned by a field trial involving the selection, procurement and installation of CV measurement equipment at a number of selected sites.

Work Pack 2

The designation of CV zones and the allocation of a CV measurement to a MPRN could be developed further by maximising the industry investment in Smart Metering. This would involve investigating sending a live CV via the Data Communication Company to suppliers and individual Smart Meters to enable consumers to understand their usage of gas energy, rather than the gas volume, which would further improve the estimation of consumer bills. This process would be simulated and tested at the newly-opened smart energy and cyber security testing facility at DNV GL's Technical Assurance Laboratory (DTAL) located in Peterborough. The cost-benefit analysis should cover the whole UK gas industry including NTS shrinkage, the implications for shippers, the impact on end user bills etc. Comments and review may be sought from Ofgem (in terms of the impact on current Regulations), Xoserve (billing process), suppliers (commercial and other impacts), distribution networks (impact on gas delivery) and National Grid Gas Transmission (gas transportation).

Work Pack 3

Work Pack 2 would build on the analysis work in Work Pack 1. Industry engagement is proposed to examine the effectiveness and achievability of the options studied. Any change in billing will impact Regulations such as Gas COTE, billing process such as Xoserve, new connections, RHI and consumer billing

Method(s) continued

A billing methodology would be recommended that delivers a solution that more closely reflects the energy delivered at a consumer meter. It would also address some of the unfairness and cross-subsidies that have recently come to light in the current FWACV system due to changes in gas quality and embedded low CV gas connections.

Work Pack 4

Following agreement from industry stakeholders and Ofgem, the next phase would be to produce the cost benefit/decision points for deployment of the change to the billing methodology.

Funding commentary

The Licensee must provide a commentary on the accuracy of its funding estimate. If the Project has phases, the Licensee should identify the approximate cost of each phase. IGTs should indicate potential bid costs expenses.

The total project costs are estimated to be £4.73m with an uncertainty of about $\pm 20\%$. The project scope is currently under development but the benefits and costs to the industry are based on the results of an NIA funded feasibility report.

For each Work Pack the estimated funding required will be as follows:

Work Pack 1 £3,850,000 split approximately as follows:

- a) £385,000 – installation of sensors and modelling at small biomethane/simple network site
- b) £1,732,500 – installation of sensors and modelling for large volume site
- c) £1,732,500 – installation of sensors and modelling for a large biomethane volume into a complex network

Work Pack 2 £550,000 CV Interfacing with Smart Meters

Work Pack 3 £165,000 Recommend a novel billing methodology

Work Pack 4 £165,000 Produce the cost benefit/decision points for deployment

These figures are preliminary, relate to the NIC project only (that is, they exclude the actual implementation of the billing system) and will be refined prior to the full NIC submission.

The NIC bid preparation costs are estimated to be in the region of £175,000 which will be recovered under the NIA and will include legal costs, bid preparation, stakeholder engagement, procurement and travel.

Specific Requirements (please tick which of the specific requirements this project fulfils)

A specific piece of new (ie unproven in GB) equipment (including control and/or communications systems and/or software)	
A specific novel arrangement or application of existing gas transmission or/and distribution equipment (including control and communications systems software)	
A specific novel operational practice directly related to the operation of the gas transportation system	✓
A specific novel commercial arrangement	✓

Accelerates the development of a low carbon energy sector & has the potential to deliver net financial benefits to existing and/or future Customers

The Licensee must demonstrate that the Solution has the potential to accelerate the development of the low carbon energy sector in GB and/or deliver wider environmental benefits to GB Customers. The Licensee must demonstrate the potential to deliver net financial benefits to existing and/or future Customers.

As stated in the Gas NIC Governance Document, the Network Licensee must provide the following to demonstrate compliance with this criterion:

- i. How the proposed Project will make a contribution to the Carbon Plan. In particular the Network Licensee should outline:
 - What aspects of the carbon plan the Solution facilitates;
 - The contribution the roll-out of the Method across GB can have in facilitating these aspects of the Carbon Plan;
 - How the roll-out of the proposed Method across GB will deliver the Solution more quickly than the current most efficient Method in use in GB; and/or*
- ii. How the proposed Project could deliver environmental benefits to Customers; and*
- iii. The expected financial benefits the Project could deliver to Customers.*

Contribution to the Carbon Plan

The UK is expected to be significantly more reliant on natural gas imports and is looking to maximise its potential unconventional gas supply sources. A reform of the billing regime involving a reduction or elimination of the practice of enriching with propane to achieve a target CV will facilitate the introduction of all GS(M)R compliant gases, both conventional and non-conventional. This will contribute to the Carbon Plan by reduction in the carbon content of distributed gas in the GB network and by reduction in the transport of propane by road tanker.

As an example, in one of the smaller gas networks, about 900,000 MWh of biomethane is injected into the network of which 5% is propane. Assuming a flow of 1000 m³/h of biomethane, about 950,000 kg of propane is required at each site per annum; this increases carbon dioxide emissions by 4 kg/MWh when the gas is used by the consumer. In GB as a whole, there are about 40 biomethane sites which will generate an additional 40,000 tonnes of carbon dioxide per annum. These increased emissions are a direct result of the current FWACV billing regime which requires low CV gases to be propanated to prevent the 1 MJ/m³ CV cap.

Similarly, the injection of hydrogen into a gas network will also lower the CV of the gas – the CV of the hydrogen/gas mix will need to be increased by the addition of propane for purely commercial reasons.

The current method of FWACV billing will not be able to deliver these benefits without increasing CV shrinkage in the system - this will increase transportation charges and hence customer bills.

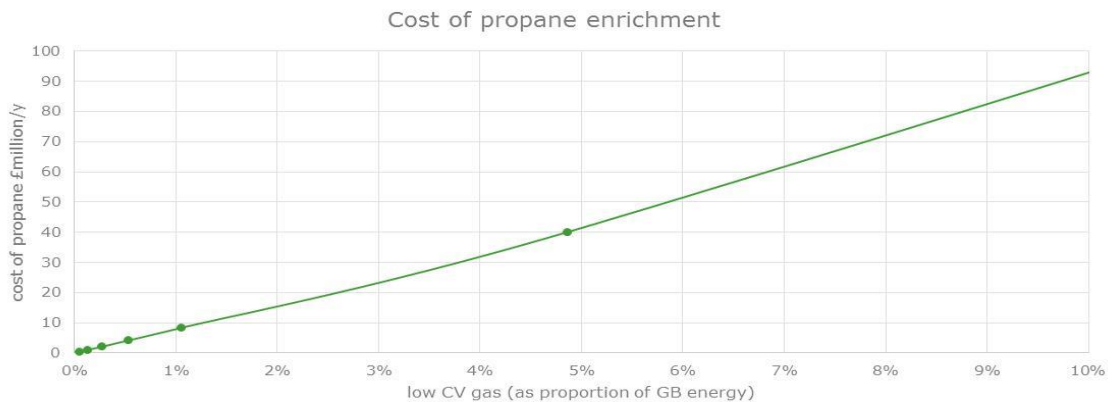
Environmental benefits

The reduction in the carbon content of GB gases and the removal of the necessity to transport propane by road tanker will reduce emissions of CO₂. Every 1 mol% of propane added to unconventional gas leads to an approximate increase of 2 mol% in the CO₂ content of the flue gas.

Accelerates the development of a low carbon energy sector & has the potential to deliver net financial benefits to existing and/or future Customers (continued)

Financial benefits to customers

The plot below shows the relationship between the amount of propane and the cost to the GB gas consumer assuming a unit price of propane to be £0.16/litre. Real daily NTS offtake data for GB for 2011 was used. It was assumed that the biomethane had a CV of 37 MJ/m³ and propane was added to increase the CV to the FWACV. Note that the relationship is not linear – the curve kicks up at higher concentrations of low CV gas. The quantity of biomethane in the distribution networks is currently about 0.27% which equates to a cost of £2M/year for propane. A commonly held prediction is that 5% of the network will comprise low CV unconventional gas – this is a propane requirement of £40M/year.



The investigation into sending live CV information to Smart Meters will improve the accuracy of gas energy usage for gas consumers in line with that provided for electricity consumers – the display in kWh will contribute to consumer knowledge of the household energy budget.

The elimination of the 1 MJ/m³ CV cap will reduce CV shrinkage in the NTS, the cost of which will not need to be passed on to consumers in the form of increased transportation charges. This is estimated to cost £16.5M per year for a million “average” gas consumers with annual consumptions of 13,500 kWh.

Consumer bills vary by about £20 per year for the same energy use without the impact of biomethane or other unconventional sources of gas – this disparity would be reduced considerably as customers pay for the energy that they actually receive.

Delivers value for money for gas Customers

The Licensee must demonstrate that the Method(s) being trialled can derive benefits and resulting learning that can be attributed to or are applicable to the gas transportation system.

As stated in the Gas NIC Governance Document, the Network Licensee must provide the following to demonstrate compliance with this criterion:

- i. What is the potential Direct Impact of the Project on a Network Licensee's gas network or on the operations of the GB System Operator;*
- ii. Justification that the scale/ cost of the Project is appropriate in relation to the learning that is expected to be captured;*
- iii. The processes that will be employed to ensure that the Project is delivered at a competitive cost;*
- iv. The expected proportion of the benefits which will accrue to the gas transportation system as opposed to other parts of the energy supply chain.*

Sub-criterion v (the internal systems, procedures and processes used by the Network Licensee to identify Project Participants and Project ideas) should be covered in the 'Project Partners and external resourcing/funding' section, below.

The "Review of the FWACV Billing Regime - Definition of Billing Constraints" report has some high level figures that quantify some of the costs of maintaining the current FWACV billing regime. This project is designed to provide a billing methodology that delivers a solution that more closely reflects the energy delivered at a meter.

The results of the methodology review will deliver benefits applicable to the gas transportation system and its users. The project will seek to deliver benefits as follows:

- i. Provide a solution to the gas distribution and transportation networks to enable them to accept all GS(M)R compliant gases without adversely impacting on NTS Shrinkage levels.
- ii. The project cost is estimated to be around £4.7 million. The current cost of propane is £2M per year and this will increase to £40M per year if unconventional gas injection increases to 5% of gas in the network. The cessation of propane injection without reforming the FWACV billing regime is predicted to impose the 1 MJ/m³ CV cap every day which will increase CV shrinkage and gas transportation charges.
- iii. An NGGD/DNV GL Steering Group and Project Management team will be in place to manage the works and costs incurred during the lifetime of the project. The selection, purchase and installation of sensors in the network is the major cost and this will be managed using a competitive tender and procurement process to ensure "value for money" for GB gas consumers. Where possible, novel and cheaper sensors using the latest micro-technologies, will be tested and sought where tracking (rather than billing) of gas is required.
- iv. There will be intangible benefits to the gas transportation system.
 - a. Network operators will be able to accept all GS(M)R compliant gas
 - b. Reduce/eliminate the requirement to manage CV in NTS System Operation and gas distribution networks
 - c. Further facilitate the decarbonisation of gas

Demonstrates the Project generates knowledge that can be shared amongst all Licensees

The Licensee must explain the learning which it expects the Method(s) it is trialling to deliver. The Licensee must demonstrate that it has a robust methodology in place to capture the learning from the Trial(s).

As stated in the Gas NIC Governance Document, the Network Licensee must provide the following to demonstrate compliance with this criterion:

- i. What new knowledge is intended to be generated from completing the Project;*
- ii. What methodology will be used to capture results from the Project and how the Project's results will be disseminated to other Network Licensees; and*
- iii. Whether the Network Licensee wishes to conform to the default IPR arrangements as set out in Chapter 9. If the Network Licensee wishes to deviate from the default IPR arrangements it must outline the proposed arrangements, justify why the arrangements are more suitable than the default arrangements and justify how the new arrangements will deliver value for money for Customers.*

A reform of the billing regime will necessarily be a GB-wide activity. This proposal will outline how all stakeholders, including Ofgem, gas transporters and shippers, will be engaged to enable new knowledge about billing reform to be generated through the delivery of the proposed NIC project.

- i. New knowledge will be generated by studying how varying gas qualities and gas supplies can be attributed to MPRNs to generate a fair and equitable energy billing system for the whole gas community.
- ii. Electronic data from CV measurements in the network and elsewhere will be captured using GPRS communication systems. Network analysis software –Synergi Gas and GBNA – will be used to understand the variation of CV within a network and to define zones of influence over periods of high and low demand. The results will be shared via reports, presentations and demonstrations to all stakeholders in the gas supply, transportation and delivery chain. Industry engagement will be key to the success of the project and will be delivered through industry forums (eg Energy Networks Association) and close collaboration with government and regulatory bodies such as Ofgem and DECC. The information and timing of the project and project results will allow gas transporters to discuss the potential implementation of a billing regime change ready for RIIO-2 price control business plan discussions.
- iii. Default IPR arrangements will apply - DNV GL will retain background IPR in Synergi Gas and GBNA.

Please tick if the project conforms to the default IPR arrangements set out in the NIC Governance Document?



If the Licensee wishes to deviate from the default requirement for IPR then it must demonstrate how the learning will be disseminated to other Licensees and how value for money will be ensured. The Licensee must also outline the proposed alternative arrangements and justify why the arrangements are more suitable than the default arrangements.

Default IPR arrangements will apply

How is the project innovative and with an unproven business case where the innovation risk warrants a limited Development or Demonstration Project to demonstrate its effectiveness.

Demonstrate why the Licensee has not previously used this Solution (including where the Solution involves commercial arrangements) and why NIC funding is required to undertake it. This must include why the Licensee would not run the trial as part of its normal course of business and why the Solution is not Research.

As stated in the Gas NIC Governance Document, the Network Licensee must provide the following to demonstrate compliance with this criterion:

- i. Why the Project is innovative and has not been tried before;*
- ii. Why the Network Licensee will not fund such a Project as part of their business as usual activities;*
- iii. Why the Project can only be undertaken with the support of the NIC, including reference to the specific risks (e.g. commercial, technical, operational or regulatory) associated with the Project.*

The Billing Methodology project looks to bring together many stakeholders in the gas supply, transportation and delivery chain to consider a step-change in CV allocation and customer billing. In recent years there has been an increase in new producers seeking access to networks on the lower pressure tiers (embedded production) and this has put pressure on the existing FWACV methodology and constrained the entry of these into the network.

The project will deliver an innovative billing methodology that allows easier access for new all suppliers of GS(M)R compliant gas while ensuring that end users continue to be billed on a much more accurate estimate of the energy they receive. Surveys of billing systems in other countries indicate that this energy-based approach to billing has not been tried before. It is an opportunity to develop an innovative solution which will facilitate the operation of a truly flexible network capable of transporting and delivering the range of conventional and unconventional gas qualities of the future.

The changes required will apply across the whole GB supply and billing systems and cannot be delivered by any one Network licensee through business-as-usual activity. The need for a collaborative and holistic review and development of a GB-wide solution forms the key commercial and operational challenges for this project.

How is the project innovative and with an unproven business case where the innovation risk warrants a limited Development or Demonstration Project to demonstrate its effectiveness - continued.

Project Partners and external resourcing/funding

The Funding Licensee should provide a description of the internal systems, procedures and processes used by the Funding Licensee to identify Project Participants and Project ideas.

The Funding Licensees should also include details of any Project Partners, External Funders or Non-Network Licensees who will be actively involved in the Project and are prepared to devote time, resources and/or funding to the Project. If the Funding Licensee has not identified any specific Project Partners, it should provide details of the type of Project Partners it wishes to attract to the Project.

National Grid Gas Distribution will lead the Project with support from Northern Gas Network. DNV GL will be a Project Partner and facilitate Project delivery and any field trials within the networks.

It is planned to include other stakeholders who are Non-Network Licensees; these include Xoserve, the Data Communications Company, gas suppliers, storage operators, LNG terminals, industry associations and Ofgem itself (if possible).

Derogations or exemptions

The Licensee should outline if it considers that the Project will require any derogations, exemptions or changes to the regulatory arrangements.

Any derogations or exemptions to the regulatory arrangements will be identified as part of the project development should this ISP be successful.

As this project is concerned with consumer billing, there may be an application for temporary exemption from the FWACV billing regime or, at least, a parallel billing regime to compare the old and proposed billing systems.

Customer impact

The Licensee should outline any planned interaction with Customers or Customers' premises as part of the Project, and any other impacts (such as amended contractual or charging arrangements, or supply interruptions).

In the early stages of the project, as part of the field trial to test the network modelling process, there may be a need to install CV measurement equipment near or in customers' premises. Any access to these premises will be undertaken using a customer engagement plan with due regard for customer data privacy.

The project team will identify any impact on customers such as amended charging arrangements, changes in gas quality or customer interaction as a consequence of the activities during the field trial. There are not anticipated to be any supply interruptions.

Details of cross sector aspects

The Licensee should complete this box only if this Project forms part of a larger cross sector Project that is seeking funding from multiple competitions (Gas NIC and Electricity NIC). The Licensee should explain about the Project it will be collaborating with, how it all fits together, and must add a justification for the funding split.

None

Any further details the Licensee feels would add to the submission

None

Contact name

Tony Nixon

Contact Address

National Grid House
Gallows Hill
Warwick
CV34 6DA

E-mail

Tony.Nixon@nationalgrid.com

Direct telephone line

01926 656 345 (land line) or 07973 236 122 (mobile)

Job title

Strategy and Innovation Manager, RIIO Delivery