

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. Please use the default font (Verdana size 10) in your submission, the text entry areas are predetermined and should not be changed. The full-completed submission should not exceed <u>11 pages</u> in total.</p> <p>Ofgem will publish all the information contained within the Screening submission.</p>			
Funding Licensee			
Northern Gas Networks			
Network Licence Project Partners			
Enzen Global Limited			
Funding Licensee area			
North of England.			
Project title			
Optimising the Transportation of Shale and Other Unconventional Gases in the UK			
Project Summary			
<i>The Licensee must provide an approximate Project start and end date.</i>			
<p>The potential increase in the availability of in on-shore shale and other unconventional gas sources brings with it both a challenge and an opportunity to consider the most efficient way to develop the gas transportation network(s) to facilitate the development of these sources of gas. Gas has traditionally been transported via the National Transmission System (NTS), through distribution networks to the consumer. This requires long distance transportation, with inherent costs and carbon loss.</p> <p>There are currently no well-defined industry processes, to enable the connection of large scale unconventional gas sources to the gas infrastructure. No large scale assessment has been completed that attempts to identify an optimal investment in new infrastructure required that considers a wider range of key factors including carbon reduction, sustainability, community energy networks and solutions, fuel poverty and customer value.</p> <p>The Project will develop and test industry protocols, commercial processes and technical solutions, for the purposes of creating an economic model, a decision-tool, a simulation model and a UK framework for shale and unconventional gas transportation. A successful project would result in the creation of a Best Practice for the UK Gas Industry, ensuring that the UK Gas Industry is well-prepared to exploit these sources of gas in the most efficient manner.</p> <p>This project will take 27 months commencing January 2015.</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	£3.2 Million	NIC funding requested	£2.8 Million
Cross Sector Projects only: Requested funding from Electricity NIC, NIA or second tier LCN Fund?	<i>If yes, please specify</i>		
	Not applicable		

Problem

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

On-shore exploration and technological development has highlighted a potential supply of a breakthrough energy resources in the UK, likely to become available in the near future. The expected availability of shale, onshore natural gas and other unconventional sources of gas in large volumes will require the development of a future UK gas network. This would foster development opportunities for other unconventional UK gases, which would otherwise be uneconomical to connect, due to smaller scale production quantities. These unconventional gases may include: bio-methane, coal bed methane and other unconventional gas supplies.

There are currently no well-defined industry processes that enable an objective assessment of the optimal investment required to facilitate the connection of large scale unconventional gas sources to the gas infrastructure. This poses a number of risks to the development of these energy sources as the economic case for resource development must also consider any associated investment in infrastructure required to transport gas to market. This project represents a timely development of the underlying analysis and tools that can support both the investment decision process and the efficient development of the gas infrastructure that ensures that the wider benefits of these new resources can be delivered.

This innovation has the ability to transform the way gas is transported in the UK, whilst also ensuring the proper utilisation of the UK's existing gas infrastructure assets.

- Making economic decisions on the transportation of unconventional gas. Possible connection options include: direct to the NTS, direct to the GDN, via an offtake, via a new connection or a combination of the above. Each of these options has implications for the distance the gas is transported, the compression it requires and the new infrastructure that needs to be built. All options will be influenced by the pressure and volume of shale gas available from the well head.
- Reducing carbon emissions. Transporting gas over longer distances, compression and additional infrastructure all require more energy and resources. Optimal decision making will help in reducing carbon emissions.
- Support security of supply. Such a framework can help develop the unconventional gas industry. Hence this will improve security of supply. This will provide greater opportunities to supply gas to fuel poverty areas.
- Reducing bills for the end consumer. Optimal decision making on best methods to connect gas can result in lower transport costs and therefore lower bills for the end consumer.
- Address the problem of balancing the network, resulting from the direct connection of high volumes of shale gas into the distribution network.

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.

The Project Method is to define industry protocols, commercial processes and a technical solution, for the purposes of creating an economic model, a decision-tool, a simulation model and a UK framework for Shale Gas transportation. This would result in the creation of a Best Practice for the UK Gas Industry, ensuring that the UK Gas Industry is well-prepared to exploit shale gas in the most efficient manner.

- The Economic Model will determine the best financial comparison between direct connection to the NTS and the connection options to the GDN. The carbon footprint associated with various options and scenarios for connection will be factored into this model.
- Decision-Tool will analyse the existing physical gas network by reviewing the existing physical parameters of the network, to ascertain the most efficient distribution of shale gas inputs.
- Simulation Model will be a mathematical model of the network inputs from unconventional gas and GIS mapped real-time demand outputs. Therefore the network can be balanced and operated to maximum efficiency.

This may be adapted from existing systems or we may have to develop new solutions.

Method(s) continued

This will result in a UK framework for unconventional Gas Infrastructure.

Commercial processes and industry protocols will be amended to manage the different points of gas intake which are likely in the new model. This amendment will analyse the impact of a change in gas intake from the NTS, resulting from connection of shale gas into the GDN. We will actively involve other key stakeholders in the UK Gas Industry, including: the National Grid UK Transmission, Shale Gas producers/ suppliers, IGEM and the other GDNs. We will share our findings for roll-out across the whole UK Gas Industry. While this solution is being developed for Northern Gas networks, the output will be applicable to the UK Gas industry and could potentially create a framework for future legislation.

The project will partner with Universities that have relevant expertise.

Enzen will leverage best practices in shale gas production and distribution in the USA, by leveraging its specialist sister company – Performance Directional Services LLC, an engineering services company in the oil and gas sector focussed on shale gas /oil elevation solutions.

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.

We plan to execute this project over a period of approximately 27 months, over two phases.

- Phase 1: Industry Processes: This phase will be to design the industry protocols, processes and an economic model. This will ensure that the knowledge created through this project will be widely available early in the project for the UK industry participants and that there is widespread agreement and visibility within the industry for the basis of Phase 2 work.
- Phase 2: Systems and Tools: This phase will be to develop simulation and decision making tools which help implement the processes and models designed in phase 1. These will be implemented in NGN and available for deployment in other DN's.

Each phase will be about 50% of the overall cost of the project. This phased approach will ensure that benefits if this project are delivered early and there is an opportunity to see the results before proceeding to the next phase.

The estimate for the project has been arrived at by estimating people resources to match the tasks in the project plan as well as the cost of materials (hardware, software) and other expenses (e.g. office accommodation).

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.*

The current working assumption for shale gas connection in the UK is direct connection into the NTS. This would result in no carbon benefits; therefore would not contribute to the carbon plan.

- i) This project will investigate and demonstrate the carbon benefits of alternative approaches including connecting directly into the distribution networks. These benefits will be achieved by:
 - Reduced use of compressors on the NTS.
 - Facilitating the utilisation of unconventional gas by the provision of more economic means of connecting to the networks.
 - Reduced need for NTS reinforcements (as a result of direct connection to the distribution system).
 - Reduced use of alternative carbon intensive heating fuels in gas poor areas.
 - Reduced gas transportation distances.
This facilitates Chapter 2 of the Carbon Plan: "Secure, Sustainable Low Carbon Energy".
- ii) Moving consumers away from more carbon intensive heating fuels in non-gas areas will provide environmental benefits to consumers.
- iii) All of the above will result in financial benefits. Additional financial benefits to the UK consumer will derive from:
 - Reduced transportation costs to UK consumer from improved use of the existing distribution network.
 - Provide a source of gas to help the consumers in fuel poverty areas
 - Over four million households in the UK are not connected to the mains gas grid and therefore use other fuel sources for their heating. These 'off-grid' fuels include kerosene heating oil, liquefied petroleum gas, coal, wood and electricity, these large off-grid populations in the UK, both urban and rural. This project could facilitate an opportunity for "off-grid" properties to gain connections to the gas network. By converting to a mains gas supply, these customers will make considerable savings on their fuel bills.

The flexibility of onshore gas supplies will play a vital part within a low carbon future consisting of a wider energy mix. UK shale gas supplies will have a significant contribution to safeguarding a consistent and reliable energy supply for the future, increasing reliability of energy supply and increasing savings potential for consumers.

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; and*
- v. How Project Participants have been identified and selected including details of the process that has been followed and the rationale for selecting Project participants and ideas for the Project.*

The major impacts from this project are the reduction in gas transportation costs and carbon which will result in a reduction in consumer bills.

- i) By transforming the way gas is transported in the UK, this project will have a direct impact not only on the Northern Gas Network (Licensee's) distribution network but also on all the other distribution networks and the GB system operator.
- ii) The project will deliver benefits on a nationwide scale and these benefits will be significant. For example, if only one NTS reinforcement is not required as a result of this project, the project cost will be more than covered. If only one substantial non-gas area was connected to gas, the savings to the consumer would outweigh the project cost.
- iii) The project will be delivered through suppliers whose costs and rates have been arrived at through a competitive process.
 - Our partner Enzen Global Limited is also a registered supplier whose rates have been chosen through a competitive process.
 - Any further suppliers will be chosen through a competitive process.
 - In addition all costs including NGN's own internal costs will be controlled through a robust project financial governance process.
- iv) All of the benefits are accrued from the gas transportation system.
- v) The project participants identified are Enzen Global Limited (Enzen), other Gas Distribution Networks, National Grid Gas Transmission, onshore gas producers and universities with expertise in the relevant areas.
 - Of these Enzen has been selected because of their experience and knowledge of the UK Gas sector, well recognised credentials in this industry, the fit of the project with their corporate vision and their willingness to invest in this project idea.
 - If selected in the screening stage, NGN will approach other project participants identified above to form partnerships.

All of our solutions will be available for roll-out across the whole of the UK network. Technical solutions will be shared, including the economic and simulation model, in addition to our staff training programmes. Resulting learning can be applied across the whole Gas Industry in the UK.

By gaining funding for this project now, we can share our learnings and prevent duplication of cost and effort, where the same solution is developed individually by multiple organisations

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.*

Everything that we develop in this project will be shared and applicable across the whole UK Gas Industry. We plan to publish regular reports, show our findings and make them publicly available. The project will follow a consultative approach, which will involve stakeholder consultations at regular intervals and key milestones. This will be followed by a published response to each consultation.

The solutions will be fully tested through a combination of simulation techniques, demonstration of interactions and integration and reviews which are facilitated through our consultative approach.

Specifically, our methods will capture learning and share knowledge by the creation of a UK Gas Industry framework. This will set out the most efficient end-to-end process of connecting large scale unconventional gas, from the production site to the consumer.

- i) New knowledge generated will be a best practice for the UK gas industry, ensuring that the UK Gas Industry is well-prepared to exploit shale gas in the most efficient manner with maximum carbon benefits.
- ii) Our methods will capture learning and share knowledge by the creation of a UK Gas Industry framework. This framework will include protocols, commercial processes, an economic model, a decision-tool, a simulation model.
- iii) We will use a combination of tools such as portals to publish results as well as webcasts and face to face meetings to involve and disseminate all the results of the project with the whole industry.
- iv) We will conform to the default IPR arrangements.

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

We will conform to the default IPR arrangements.

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.*

There are currently no well-defined industry processes that enable an objective assessment of the optimal investment required to facilitate the connection of large scale unconventional gas sources to the gas infrastructure. This poses a number of risks to the development of these energy sources as the economic case for resource development must also consider any associated investment in infrastructure required to transport gas to market. This project represents a timely development of the underlying analysis and tools that can support both the investment decision process and the efficient development of the gas infrastructure that ensures that the wider benefits of these new resources can be delivered.

To date there has been very little focus on the delivery of large scale unconventional gas resources into the gas transportation network. There has been little or no direct evaluation of these issues between producers and the transportation networks. Therefore, there is a need to develop a range of innovative solution which addresses an efficient, low carbon solution which also takes account of the social energy needs.

The future models required to determine optimal investment decisions will be required to consider and evaluate a wider set of criteria and factors than apply today. These include issues related to carbon reduction, sustainability, and socio-economic factors alongside the traditional factors of cost, safety and security of supply that will apply across the UK energy sector.

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.

This will require the identification, development and trialling of a number of new and innovative approaches to addressing the key issues that the wider industry will face in facilitating the efficient development of new sources of gas. There are a number of risks that relate to this project:

- The outcome proposed within this project have not been tried before and have evolved as a response to the wider changes in the energy market and government policy. The scale of the developments required in this area and that inherent risks within the development of these approaches that mean that are unlikely to be progress without innovation funding.
- Additionally, the benefits from this project will accrue largely outside of the transportation networks but to the wider gas industry, customers and the UK economy.
- The economic case for the large scale development of unconventional sources of gas is at present unclear and missing key information on the requirements and costs of the transportation infrastructure. Early investment is required to investigate these issues to provide the robust case required for the wider development of these resources.

The project findings will be used to inform and where necessary support changes to gas transportation policy in advance of gas fields being developed. And act as a wider stimulus to the consideration of the issues to be addressed in achieving optimal investment in gas transportation infrastructure.

Project Partners and external resourcing/funding

The Licensee must provide evidence of how Project Partners have been identified and selected, including details of the process that has been followed and the rationale for selecting participants and ideas for the Project.

The Licensee should provide details of any Project Partners who will be actively involved in the Project and are prepared to devote time, resources and/or funding to the Project. If the 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.

Enzen Global Limited (Enzen) has been selected as project partner for this project and has been involved in the preparation of this bid. In addition NGN also propose to form partnerships with National Grid, unconventional gas producers and UK universities which have expertise in this subject area if the project is selected at the screening stage.

NGN will also work with IGEM to develop any new industry standards which may be identified as a result of this project. IGEM will be made aware of the project and any requirement for new or revised standards will be initiated with IGEM's technical section. NGN will nominate a member of its engineering staff to support any standards for work associated with the project.

Enzen has been selected because of their experience and knowledge of the UK Gas sector, well recognised credentials in this industry, ability to bring in shale gas best practices from the United States, the fit of the project with their corporate vision and their willingness to invest in this project idea. Enzen are focussed on the energy and utility sectors and are recipients of the Society of British Gas Industry's Leadership award 2012. Enzen have already invested in creating this proposal and laying the basic foundations for this project.

Enzen also propose to leverage Performance Directional Services, LLC (PDS), for shale gas production and distribution best practices in the United States. PDS is an engineering services company in the oil and gas sector, and offering customized engineering solutions to elevate shale gas/oil and is part of the Enzen family.

Derogations or exemptions

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

None.

Customer impact

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

None.

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, Electricity NIC or LCN Fund). 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.

Not Applicable.

Any further details the Licensee feels would add to the submission

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