

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			
Advanced Plasma Power, Progressive Energy, CNG Services Ltd			
Funding Licensee area (or where the licensee does not operate in a specific area the geographic location(s) of the Project)			
National Grid Gas Distribution			
Project title			
Commercial BioSNG Demonstration Plant			
Project Summary			
<i>The Licensee must provide an approximate Project start and end date.</i>			
<p>This Project will demonstrate the gasification of waste at scale and in a commercial environment to produce renewable, GSMR compliant methane (BioSNG) in order to enable the development of fully commercial facilities. BioSNG has a far smaller carbon footprint than fossil natural gas and could meet 40% of UK domestic gas demand, resulting in many customers being able to benefit from the continued use of the gas network into the future.</p> <p>The Project partners will construct a plant that produces 22GWh of BioSNG per annum. Revenue from waste and the sale of the BioSNG will cover operating costs but will not provide a return to funders. The construction, operational and performance risks of the BioSNG process are significant barriers to the development of the technology. This Project will greatly reduce these risks, giving confidence to potential developers and funders of commercial-scale plants.</p> <p>The Project complements the BioSNG Demonstration Plant project which focused on technical feasibility. Initial design work will start in January 2016 and the facility should be operational by November 2017. There is an opportunity to attract funding to the Project from the Department for Transport if it starts in early 2016.</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	£21.1m	NIC funding requested	£6.0m
Cross Sector Projects only: Requested funding from Electricity NIC or NIA?	<i>If yes, please specify</i>		

Problem(s)

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

The UK has committed to increase renewable energy production to 15% by 2020 and has recognised that it is essential to decarbonise heat in order to meet this target. However, electrification of heat via heat pumps etc. is challenging because demand is highly variable and would require a large and uneconomical investment in electrical generation and distribution infrastructure and in millions of new heating appliances.

Renewable natural gas offers a solution that makes use of existing infrastructure and heating appliances such as condensing boilers. Biogas produced by anaerobic digestion (AD) cannot treat waste containing fossil or lignocellulosic material which means it can only meet 11% of domestic demand. BioSNG is a thermal gasification process, providing a route for conversion of materials such as municipal and commercial waste that are unsuitable for AD. It has the potential to meet 40% of domestic gas demand.

The NIC-funded "Bio-SNG Demonstration Project" is proving the technical feasibility of this approach at small scale but it is necessary to demonstrate the technology at a larger scale to confirm that the process provides the expected commercial benefits and performance, and show successful overcoming of commercial hurdles, including:

- Acceptance of construction and performance risk by an engineering contractor.
- Acceptance of plant unavailability risk by customers.
- Uncertainty over the level of project returns.

Organisations such as the Green Investment Bank, Linde and Veolia have made it clear that it is very difficult to support a commercial BioSNG development without carrying out due diligence on a plant operating on a continuous basis at a significant scale. This is required to demonstrate that a commercial-scale plant can be built within budget and operate reliably.

The requirement for a commercial demonstration unit is evidence by other successful gasification technologies used by companies such as Enerkem, Nextera and Energos that have used medium size facilities as a stepping stone to fully commercial plants. Similarly, early commercial biomethane AD plants required capital grants.

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 proposed Project is to build and run a commercial demonstration plant operating at around 1/10th of a fully commercial scale. The objective is to provide evidence to project developers, contractors, waste providers, off-takers and funders that the risks associated with a larger scale plant would be acceptable.

The technical integrity of the BioSNG process will have been confirmed in the on-going BioSNG Demonstration Plant project. To date that project has completed the detailed design phase and orders have been placed for all work packages. Equipment has started to be delivered to site and construction has commenced. The proposed Project will provide an empirical basis for the design, construction and operation of commercial scale facilities.

Method(s) continued

The Project will be broken down into the following steps:

- 1) Securing planning permission and environmental permit at APP's Swindon site.
- 2) Detailed design and safety review.
- 3) Commercial contract development with waste provider and gas off-takers including agreement of appropriate guarantees and gas and waste specifications.
- 4) Equipment procurement through competitive tender and agreement of commercial terms such as performance specification, payment terms and factory acceptance tests with suppliers.
- 5) Installation and integration of work packages.
- 6) Cold and hot commissioning, training of operational staff and handover of plant.
- 7) Operation for a period of one year on a commercial basis.
- 8) Dissemination of results to encourage development of further thermal BioSNG facilities.

The successful outcome of the project would be the lowering of the perceived risk profile to a level that permits funding institutions to invest in commercial-scale plants.. Once these plants are deployed, they will make a significant contribution to the decarbonisation of heat, using the existing gas infrastructure.

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 detailed design activity and engagement with suppliers undertaken in the ongoing BioSNG Demonstration Project has provided well-defined process plant specifications and costings The final costs for the commercial demonstration plant will be subject to tender exercise and are therefore +/- 20% at this stage.

Phase 1 – Planning and Permitting	Jan 16 – Jun16	£0.2m
Phase 2 – Design and safety review	Jan16 – Jun 16	£1.6m
Phase 3 – Commercial contract development	Jan16 – May 16	£0.6m
Phase 4 – Procurement	Mar 16 – Jun17	£14.5m
Phase 5 – Installation	Apr 17 – Jun 17	£0.7m
Phase 6 – Commissioning	Jun17 – Dec17	£1.1m
Phase 7 – Operation	Jan 18 – Dec 18	£Nil
Phase 8 – Dissemination	Jan 16 – Dec 18	£1.8m
Project management	Jan 16– Dec 18	£0.7m
Total Cost		£21.1m

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 Carbon Plan identifies a need for 10-38TWh of low carbon heat delivered through networks by 2030 and identifies biomethane as the least disruptive technology. However, it recognises that anaerobic digestion can only meet a small proportion of this heat demand, particularly after allowing for competing demands for digestible biomass. Thermal gasification can produce BioSNG from feedstocks such as mixed general waste or lignocellulosic material that are unsuitable for anaerobic digestion, expanding the overall contribution that low carbon substitute natural gas can make.

The commercial demonstration facility proposed in this project will produce 22GWh of BioSNG per annum. It will facilitate follow-on full scale commercial facilities around ten to twenty times larger. A full scale facility would process around 300ktpa of municipal waste, which is a similar size to existing waste to energy plants.

The commercial demonstration plant should enable the development of multiple commercial facilities which could start operation by 2020 and produce 1TWh/a of BioSNG. Conservatively, the market should be able to support 7TWh/a of gas production by 2025, making a major contribution to the Carbon Plan's target. In total these plants would process 3.3Mte/a of waste.

The Carbon Plan also identifies energy recovery from waste as one of the main strategies to reduce greenhouse gas emissions from landfill. Eunomia's Residual Waste Infrastructure Review identifies 6Mte/a of municipal waste that is expected to be sent to landfill in 2020. In addition to this, 9Mte/a of commercial and industrial waste is expected to be available. The BioSNG plant roll out set out above would divert 22% of this feedstock from landfill to green gas production by 2025, eliminating methane emissions from this waste.

BioSNG delivers low carbon heat to customers without requiring any expenditure on new heating appliances, power infrastructure or change in behaviour. It also increases the energy security of the UK by utilising waste, its largest source of indigenous biomass, as well as other biomass feedstocks.

A full scale plant is expected to operate without subsidy and to sell gas at current wholesale prices. BioSNG avoids the need to invest in unnecessary additional electricity infrastructure, as the gas network is already designed to deliver peak winter demand. Overall the Project will offer very good value for money to consumers compared to other approaches to decarbonising heat.

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 Project will produce gas that meets the GSMR specification, and will therefore have no adverse impact on the network. The network will benefit from a new secure source of renewable gas.

The current forecast of Project cost is £21m which can be broken down into £1.8m of dissemination work, £2.0m relating to preparation and distribution of compressed BioSNG, £1.8m of development costs and £15.5m of capital cost for the BioSNG demonstration plant.

The development cost represents 9% of total Project costs which is typical for a project of this scale. Dissemination costs are higher than usual at 8% of total cost which reflects the focus on using the Project to enable development of further plants. The compressed BioSNG costs relate to the requirements of the DfT Advanced Fuels competition which is discussed below.

The capital cost of the plant is slightly higher than an AD plant producing a similar quantity of gas. This reflects the additional costs of a first of a kind plant and the difficulties of treating mixed waste. Eventually the technology should have similar or lower costs than AD.

The overall budget leverages on work carried out in the on-going BioSNG project and the experience of the Project collaborators. The cost will enable a major increase in the amount of low carbon substitute natural gas in the network and represents very good value for money for the overall impact it will have.

The Project budget includes a significant amount of 3rd party expenditure on equipment. This will be procured through a competitive tender process to ensure the lowest price is achieved. The management of the internal costs of the Project collaborators will follow the same approach that has been used in the current project to ensure they are proportional to the work involved.

The Department for Transport is expected to fund the majority of Project costs through its Advanced Biofuels competition; this provides excellent value for money for the network. There will be some additional costs in meeting the requirement to produce compressed BioSNG for this competition but the Project will as a result demonstrate both the use of BioSNG for domestic heat and as a transport fuel. This will show the grid's ability to be an efficient method of delivering heat and future transport fuels, benefitting all users.

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.*

The Project aims to generate the commercial knowledge that will facilitate the construction of large scale BioSNG plants. This knowledge can be broken down as follows:

1. Performance data from the operating plant showing waste processed, BioSNG produced, emissions, conversion efficiency, availability and costs of operation, together providing a basis for value engineering in commercial scale facilities.
2. Information on the construction of the facility such as cost, delivery timescales and project plan.
3. Economic indicators of plant performance such as revenue and profitability.
4. Methods and procedures for the construction and operation of a BioSNG facility.
5. Experience of contracting with commercial waste suppliers and gas users for this technology.

This knowledge will allow developers and funders of commercial BioSNG plant to properly quantify and mitigate the risks of construction and operation to enable the development of commercial plants.

The knowledge will be captured by following best practise engineering and quality control procedures to ensure the Project is properly documented and key performance indicators are measured and reviewed. This information will be summarised in regular reports.

Dissemination of results is at the heart of the Project because the communication of the knowledge gained is an essential step in enabling development of full scale facilities. Dissemination will use the following routes to communicate to Network Licensees and others:

- A Project website will produce regular updates on progress and performance and will be supported by targeted email and social media.
- Conferences and exhibitions will be used to communicate to industry and academia.
- Press and public relations will be used to inform policy and decision makers.

The demonstration facility will act as a showcase for BioSNG production and will integrate a visitor centre to promote the technology.

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.

The Project will aim to conform to the default IPR arrangements set out in the Gas NIC Governance Document. Should it become necessary for the Project to deviate from these arrangements at the Full Submission stage, the full Project submission will demonstrate how the learning and benefits will be disseminated.

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 current BiosNG Demonstration Project establishes the technical feasibility of the BioSNG process. This Project follows on, and focuses on the commercial innovation necessary to enable the construction of commercial plants (the necessary technical research has already been carried out). Funders, waste suppliers, power off-takers and construction contractors are generally unwilling to accept the risks associated with a first of a kind plant and require a demonstration that the technology can operated commercially before proceeding with developments.

There are no routes for National Grid to commercially benefit directly from the development of this technology, so National Grid would not invest in this Project as part of its normal course of business.

The Project will not provide a return to its funders. The aim is for revenues from accepting waste and selling gas to cover the operational costs of the plant, but unrecovered capital investment is still required. The case for this investment cannot be made under business-as-usual conditions.

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.

Any single company is unable to fully capture the benefits of the future plants. The Project would enable a number of companies to develop and benefit from BioSNG, including the Project partners but the rewards to any single company would be insufficient to enable them to fully fund the costs. The contribution from NIC is required because it bridges this gap.

The Project has significant commercial risks. A waste supplier and gas off-taker must be secured and there are construction, cost and schedule and performance risks. A comprehensive risk register will be maintained for the Project and significant expenditure will be deferred until the risk profile is assessed as manageable.

The key risk to a successful outcome from the Project is the level of Government support available to BioSNG plants. Initially, commercial plants will need support in order to compete with fossil natural gas. The Government will need to maintain its commitment to the sector through the Renewable Heat Incentive for the carbon savings expected from the Project to be achieved. Project partners will engage with DECC to encourage support to be maintained. By 2025, BioSNG plants are expected to be fundable without support.

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 will continue to work with the partners who have been successfully delivering the BioSNG Demonstration Plant project. These are:

- Advanced Plasma Power (APP), which owns and operates the Gasplasma® facility in Swindon, UK. APP has significant internal process engineering capability as well as unique plant operational experience.
- Progressive Energy, which is an internationally recognised clean energy project development company with a particular focus on decarbonisation of the energy sector through carbon capture and storage and renewables.

These will be joined by CNG Services, an engineering services company with particular expertise in the use of compressed natural gas as a vehicle fuel.

The Project partners will provide funding to the Project with APP making the largest contribution of around £3m.

The main source of funds will be a grant from the Department for Transport. The Project partners have applied for £12m from the Advanced Biofuels competition and have successfully passed the first round. The six remaining projects are competing for a total budget of £25m. The Department will decide on who will receive grants in July 2015. This grant provides the opportunity to greatly increase the value for money available from the NIC funding.

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 impacts (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 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
<p>There are several reasons for starting the development of the commercial plant in 2016.</p> <p>Firstly, the availability of funding from the Department of Transport is limited to projects commencing early in 2016. These funds will enable the construction of a far larger plant than would be possible using NIC and project participant funds.</p> <p>Secondly, the current BioSNG Demonstration Plant project will begin producing useful results in Q4 2015 and will produce data that will inform the design of the commercial plant in the first half of 2016. This means that commencing the Project in 2016 allows the best use of the demonstration plant results. Further results will continue to feed into the design and operational planning but the most important data will be obtained early in the project.</p> <p>Thirdly, it is important to begin development of fully commercial BioSNG plants early in the 2020's to allow the Carbon Plan targets for the decarbonisation of heat to be met. Adoption of new technology is slow and it will take several years for plants producing a significant amount of BioSNG to be built. Starting this Project in 2016 will result in a fully operational commercial demonstrator in 2018 which will enable the first commercial plants to commence operation in 2020, which is in line with the Carbon Plan targets.</p>
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