Notes on Completion: Please refer to the appropriate NIA Governance Document to assist in the completion of this form. The full completed submission should not exceed 6 pages in total.

NIA Project Registration and PEA Document

Date of Submission

May 2015

Project Reference Number

NIA_NGGD0059

Project Registration

Project Title

Impact of Distributed Gas Sources on the GB Gas Network

Project Reference Number

NIA_NGGD0059

Project Licensee(s)

Cadent

Project Start

June 2015

Project Duration

1 year and 8 months

Nominated Project Contact(s)

National Grid Gas – Lorna Millington / Robert Cairns – lead GDN, SGN – Alexander Webb, Wales & West Utilities – Richard Pomroy

Project Budget

£225,341.00

Summary

- Location, Timing of coal bed methane and shale gas sources, broad rollout pathways for other sources.
- Properties of sources (CV, pressure, flow rates, profiles etc.)
- Development of distributed sources and gas network archetypes
- Review of International Best Practice, solutions, economics and barriers to incorporating new distributed gas sources
- Focus on Australia (CBM), US (Shale), France (Anaerobic Digestion)
- Consultation with Industry and other stakeholders to understand the barriers to connection of new distributed sources
- Categorisation of barriers by technology type and gas sources characteristics
- First Stage of technology filtering, matching sources archetypes to network pressure/type for in-depth analysis
- Techno-economic analysis of impacts of new sources on the UK gas network (generic and case study), including practical implications, assessment of regulatory and policy implications/barriers
- Specification for technical solutions, ranked by NPV and other key matrices
- Assessment of new/alternative commercial models and updated regulatory/policy requirements to facilitate the introduction of new distributed gas sources
- Presentation of ranked scenarios
- Strategic impacts assessment, including costing analysis
- Report on implications of findings, presentation and recommendation for future developments

Nominated Contact Email Address(es)

Innovation@cadentgas.com

Problem Being Solved

A range of new distributed gas generation sources are set to be deployed in increasing numbers in the coming years, each with very different characteristics and geographic/temporal distribution. Their widespread deployment could have a significant impact on the different segments of the distribution grid, whilst new commercial and regulatory arrangements may be necessary to support this once in a generation transition.

This is likely to have profound implications for gas network stakeholders, in particular the Gas Distribution Networks (GDNs), whose networks will be expected to bear the brunt of new distributed gas source connections.

Distributed sources of unconventional gas are deployed in a number of countries and the GB networks wish to understand international best practices, learn lessons from their introduction and identify existing barriers to their introduction.

Method(s)

This project proposes to rapidly identify the segments of the network that are relevant to each source and to evaluate the economic, technical and practical impacts of connecting them to different parts of the gas grid, as well as any regulatory changes, or new/modified commercial arrangements that may be required to facilitate their deployment.

The research will consist of three main phases:

1. Data collection and analysis phase: this phase includes an assessment of the likely rollout scenarios for shale gas and coal bed methane (CBM) within GB, an international review of best practice in relation to accommodating new gas sources and understanding the various barriers to the connection of new gas sources to the grid.
2. Network impacts analysis phase: this phase forms the main bulk of the project's activities and includes detailed technical modelling of the options available to accommodate new gas sources, as well as an economic impact analysis for these solutions.

Reporting and discussion phase: this final phase looks to bring together the modelling of individual solutions with the scenarios developed in phases 1 & 2 to assess the high-level strategic impacts of new distributed gas sources in consultation with GDNs.

Scope

- Location, Timing of coal bed methane and shale gas sources, broad rollout pathways for other sources.
- Properties of sources (CV, pressure, flow rates, profiles etc.)
- Development of distributed sources and gas network archetypes
- Review of International Best Practice, solutions, economics and barriers to incorporating new distributed gas sources
- Focus on Australia (CBM), US (Shale), France (Anaerobic Digestion)
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Objective(s)

Within each phase specific objectives will be delivered including:

- Produce scenarios for the deployment of coal bed methane and shale gas from 2015-2050 (with increased granularity in the period 2015-2025)
- Show High-level trajectories for the rollout of biogas and bio-SNG

- Develop archetypes for characterising the properties of new distributed gas sources
- Produce a set of network archetypes, relevant to the various distributed gas sources
- Report on international best practice in connecting new distributed gas sources to the gas grid and lessons learned for the GB gas network
- Report highlighting the technical, practical barriers, regulatory and commercial barriers to the connection of new distributed gas sources to the grid, and best practice in overcoming those barriers, or where no existing solutions exist, recommendations for overcoming them
- Present ranked technical solutions by net present value, with additional outputs on annual operating cost, and pressure at each customer node for each supply/demand case. Sensitivity of these variables to change in inputs.
- Produce up to three case studies on the connection of known distributed gas sources to local distribution networks to demonstrate the application of the techno-economic model to real world scenarios
- List of any new or alternative commercial arrangements that may be necessary to support the connection of new distributed gas sources to the gas network.
- List of any new policy mechanisms or regulatory changes that may be required to facilitate these new/modified commercial arrangements.
- Produce a finalised list of technical and commercial solutions for incorporating new distributed gas sources at different, tailored to specific GDNs where appropriate
- Prioritise regulatory changes or new/revised commercial arrangements that could help GB to maximise the benefits/minimise the impacts of connecting new gas sources.
- Clear and timed next steps for GB Networks in accommodating new distributed gas sources

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Produce an evidence based requirements and strategic impact assessment for GB Network Stakeholders to better understand the implications of new distributed gas sources, both on an individual project, based on high level assessment, on a strategic long-term planning basis, and to develop well-grounded short and medium-long-term plans for dealing with this major change to existing gas energy markets.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The scale of this project has been developed from a much larger tendering process, managed by the Energy Innovation Centre into assisting the GB networks to develop cutting edge research around the future of GB Gas Networks. Networks felt initial submissions to be very broad and required shaping into shorter manageable pieces of research.

This relatively short research work draws on the skills and knowledge from both business and academia to model future impacts, using three international markets. These have been deemed as closest to the GB market and will provide best practices that, with some modification provide a signpost for future work packages.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

Mainly UK desk based research, international experts and lessons will be brought to the UK to assist in the research. Academic Network Optimisation Modelling work will be undertaken by Imperial College London, Sustainable Gas Institute.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

External: £169,175

Internal: £56,166.10

National Grid Gas:	External Funding £96,671.43	Internal Funding £32,094.91
SGN:	External Funding £48,335.71	Internal Funding £16,047.46
Wales & West Utilities:	External Funding £24,167.86	Internal Funding £8,023.73

Project Eligibility Assessment Part 1

There are slightly differing requirements for RIIO-1 and RIIO-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RIIO-2 / RIIO-1).

Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations (Please complete sections 3.1.1 and 3.1.2 for RIIO-2 projects only)

Please answer **at least one** of the following:

How the Project has the potential to facilitate the energy system transition:

n/a

How the Project has potential to benefit consumer in vulnerable situations:

n/a

Requirement 2 / 2b

Has the potential to deliver net benefits to consumers

Project must have the potential to deliver a Solution that delivers a net benefit to consumers of the Gas Transporter and/or Electricity Transmission or Electricity Distribution licensee, as the context requires. This could include delivering a Solution at a lower cost than the most efficient Method currently in use on the GB Gas Transportation System, the Gas Transporter's and/or Electricity Transmission or Electricity Distribution licensee's network, or wider benefits, such as social or environmental.

Please provide an estimate of the saving if the Problem is solved (RIIO-1 projects only)

This research project will provide long term savings to GB customers by providing better long term planning decisions. Using International experience, internationally recognised academia and experts to provide evidence based strategic impact assessment of future scenarios.

Please provide a calculation of the expected benefits the Solution

Research Project

Please provide an estimate of how replicable the Method is across GB

Research Project

Please provide an outline of the costs of rolling out the Method across GB.

Research Project

Requirement 3 / 1

Involve Research, Development or Demonstration

A RIIO-1 NIA Project must have the potential to have a Direct Impact on a Network Licensee's network or the operations of the System Operator and involve the Research, Development, or Demonstration of at least one of the following (please tick which applies):

☐ A specific piece of new (i.e. unproven in GB, or where a method has been trialled outside GB the Network Licensee must justify repeating it as part of a project) equipment (including control and communications system software).

☑ A specific novel arrangement or application of existing licensee equipment (including control and/or communications systems and/or software)

☐ A specific novel operational practice directly related to the operation of the Network Licensees system

☑ A specific novel commercial arrangement

RIIO-2 Projects

☐ A specific piece of new equipment (including monitoring, control and communications systems and software)

☐ A specific piece of new technology (including analysis and modelling systems or software), in relation to which the Method is unproven

☐ A new methodology (including the identification of specific new procedures or techniques used to identify, select, process, and analyse information)

☐ A specific novel arrangement or application of existing gas transportation, electricity transmission or electricity distribution equipment, technology or methodology

☐ A specific novel operational practice directly related to the operation of the GB Gas Transportation System, electricity transmission or electricity distribution

☐ A specific novel commercial arrangement

Specific Requirements 4 / 2a

Please explain how the learning that will be generated could be used by the relevant Network Licensees

Unique piece of research using international best practice, lessons learnt from existing international practices and using a wider team with internationally recognised expertise. Using Imperial College London's Sustainable Gas Institute, with its reputation for supporting this type of high level gas future modelling to reflect these markets onto GB Gas Networks, given future scenarios.

This work will support the UK's strategic aim to decarbonise energy over the next 40 years.

SGN's 2015 NIC for Real-Time Networks intends to take the learning from this project to identify key areas of significant distributed gas source potential. Learning from this project will also help inform SGN's new technology parameters for their Real-Time Networks projects adding further value to this research.

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

All GB Gas Networks recognise the role gas plays within UK's energy requirements and its impact on the environment. Gas Networks are collaborating collectively on research projects that meet the future requirements of customers, UK economy, reduction in emissions and future investment decisions.

We believe this type of research will provide valuable insights that will result in more efficient long term planning decisions across all Networks.

☑ Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

Is the default IPR position being applied?

☑ Yes

Project Eligibility Assessment Part 2

Not lead to unnecessary duplication

A Project must not lead to unnecessary duplication of any other Project, including but not limited to IFI, LCNF, NIA, NIC or SIF projects already registered, being carried out or completed.

Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

n/a

If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

n/a

Additional Governance And Document Upload

Please identify why the project is innovative and has not been tried before

n/a

Relevant Foreground IPR

n/a

Data Access Details

n/a

Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

n/a

Please identify why the project can only be undertaken with the support of the NIA, including reference to the specific risks(e.g. commercial, technical, operational or regulatory) associated with the project

n/a

This project has been approved by a senior member of staff

☑ Yes