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

Feb 2014

Project Reference Number

NIA_SGN0040

Project Registration

Project Title

Acoustic Communications in Gas Mains

Project Reference Number

NIA_SGN0040

Project Licensee(s)

SGN

Project Start

February 2014

Project Duration

2 years and 1 month

Nominated Project Contact(s)

Martin Chorley, innovation Project Manager

Project Budget

£57,008.00

Summary

The scope of the project is to:

- Collate operating parameters and configuration of typical test network
- Understand typical pipe networks and their acoustic characteristics
- Complete a review and evaluation of relevant published research
- Develop suitable measurement, test and recording techniques to gather data acoustic data
- Complete a laboratory simulation to prove test method
- Complete an acoustic study on a typical gas main network
- Analyse acoustic data and pipe networks characteristics of signal transmission
- Establish the characteristics of a potential suitable signature acoustic signal for transmission
- Investigate equipment and techniques to transmit and receive suitable signature acoustic signals
- Produce a final report and presentation.

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

Scotia Gas Networks (SGN) have a large number of leased telephone lines which are used to communicate with remote electronic

equipment to monitor and control low pressure networks, across both our Scotland and Southern licence areas. These systems allow network pressures to be constrained at the safest minimum low pressure to ensure security of gas supply to the customer, whilst minimising gas leakage.

The installation and rental cost of these telephone lines are high.

Leased lines suffer from system disconnections and line faults, which often results in the loss over extended periods of monitoring and control facilities with the consequence of higher network pressures and increased leakage. These faults are generally difficult to resolve, requiring multiple site visits between SGN and service providers which is problematic to coordinate. Associated remedial work is generally outside the direct control of SGN relying on the cooperation of service providers.

Method(s)

This project is concerned with developing an alternative communication method to interconnect pressure monitoring and control equipment. The technique to be investigated is acoustic communications within low pressure gas networks. A typical acoustic system may consist of transmit & receiver sensors mounted on a pipe line designed to convey operational data using pulses of high frequency sound through the gas media.

This project seeks to establish the feasibility of the acoustic technique, through laboratory simulation and field trials to gain an understanding of typical pipe network acoustic characteristics under operational gasconditions to ascertain a suitable transmission signature signal for data transfer and to discover the potential restrictions of the technique.

Scope

The scope of the project is to:

- Collate operating parameters and configuration of typical test network
- Understand typical pipe networks and their acoustic characteristics
- Complete a review and evaluation of relevant published research
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<p><p>

A previous change request was submitted for this project due to delays in agreement and signing of the legal contract between SGN and the project partner. This was resolved, however shortly after there was a change in personnel at the project partner. This resulted in further negotiations, specifically around the Intellectual Property Rights (IPR) and Warranties sections of the legal schedules. The issues around these sections have nowbeen resolved and progress is being made to allowthe project to continue and work towards the success criteria defined in the original registration.

Objective(s)

The objectives of this project are to:

- Develop proof of concept of an acoustic communication solution capable of replacing telephone lines for pressure data logger and control equipment.
- Evaluate the performance of the acoustic technique to establish the potential transmission distance.
- Provide relevant information to other Network Licensees.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The success criteria for the project are to:

- Understand the acoustic characteristics of a typical low pressure gas network.
- Identify the capability of the acoustic technique in a gas environment to provide a reliable communication medium.
- Highlight the requirements of equipment to receive and transmit suitable acoustic signals.
- Produce and disseminate learning to other Network licensees.

In order to determine whether this project has been successful or not at various stages, the project must progress through a number of stage gate milestones. SGN's Project manager will evaluate the performance again the requirements before approving progress to the next stage.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

This phase of the project is limited to investigating the concept feasibility of acoustic communications, through developing a suitable measurement system to collect field data from a typical low pressure gas network, and the analysis of data to gain an understanding of the acoustic characteristics of the pipe work operating at low pressure with the aim of identifying appropriate acoustic signals for reliable data transfer and the type of equipment required to transmit and receive data.

It is envisaged at this stage that further phases of extensive field trials and development would need to follow, however we have limited the scale of the current project to ensure unnecessary expenditure is not committed before proof of concept is established.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

This project will be undertaken at the Institute of Sound and Vibration Research at the University of Southampton, with local field trials on a suitable SGN low pressure gas network. It is expected the technique would be applicable throughout GB

Revenue Allowed for the RIIO Settlement

During the RIIO-GD1 it is estimated SGN will spend approximately £4.96m on the leasing of 6000 phone lines used for pressure monitoring and control applications, plus staff time to investigate and rectify faults. As this technique is at a low TRL it is not yet possible to determine whether revenue saving will be likely during the RIIO-GD1 period. However it is believed that if it can be progressed successfully through to a reliable working system this technique has the potential to enable cost saving in communications costs and opens up opportunities to develop improved pressure control systems.

Indicative Total NIA Project Expenditure

The total allowable NIA expenditure to be claimed for this project is £51,307 (90% of the eligible project costs to be incurred during the NIA period).

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)

As this project focuses on a feasibility study it is difficult to quantify the potential financial benefits at this stage.

It is envisaged that a reliable acoustic communication system would lead to the following financial benefits:

- Reduction in rental costs for phone lines (SGN annual budget for data collection and profile control, which includes phone line rental costs is £620k).
- Reduction in telephone line installation costs (Average cost £2000 per line).
- Reduction in fault rectification costs.
- Improved pressure control and reduction in gas leakage as existing profile control systems could be replaced by closed loop control enabled by more cost effective data transfer between equipment.

Please provide a calculation of the expected benefits the Solution

N.A. This is a research project

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

SGN have approximately 6000 telephone lines which could potentially be affected by the successful outcome of this project. It can be assumed that the other networks also have a large collective number of similar rented lines across Great Britain (GB) that this method could ultimately apply to if future stages are progressed following this feasibility project.

Similar to SGN, the other Network Licensees have not specifically identified an allowance for telephone rental for pressure monitoring and control in their RIIO-GD1 proposals; however it is likely that the other networks have a proportion of leased telephone line on data logger & profile control systems. Therefore, this project does have the potential to be rolled out across GB and provide future savings in the capital and operational costs associated with data communications, while improving asset integrity.

It must be noted that these figures are estimates rather than real network data and the nature of leased line usage across all Network Licensees and installations will vary, which could affect the potential to apply the method and the benefits of applying it. The main focus of this project is to investigate the feasibility of acoustic communications within low pressure gas mains, and understand potential constraints on its operation.

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

There are minimal costs associated with sharing the conclusions and recommendations of this feasibility study with other Network Licensees, which will be the first step towards rollout across GB. As stated above, the very early TRL means that it is not possible to estimate the costs of deployment at this stage.

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

All Network Licensees will be able to use the learning generated as the outcome of this feasibility study into acoustic communications within a low pressure gas main will be presented in a clearly defined report that will focus on the suitability of the technique to provide a reliable communication medium.
The conclusions and recommendations could be used by relevant Network Licensees to determine whether future development of this technology could provide benefits in the cost and reliability of pressure monitoring and control systems, as well as potentially enabling other enhanced pressure control innovations to be considered.

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

n/a

☑ 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