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

Jan 2015

Project Reference Number

NIA_SGN0048

Project Registration

Project Title

Bar Hole Zone Rating (Stage 1)

Project Reference Number

NIA_SGN0048

Project Licensee(s)

SGN

Project Start

February 2015

Project Duration

0 years and 7 months

Nominated Project Contact(s)

Ryan Smith, Innovation Delivery Manager

Project Budget

£11,716.00

Summary

The scope of the project isto carry out a detailed technical, environmental and legislative assessment on the bar hole sampling tools used in the GB gas industry to date and identify the control measures and technical design requirements that can be discussed with a manufacturer in a future Stage 2.

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

Where gas escapes are reported, SGN utilise an impact searcher bar or a rock drill to create sample points in the road surface, footpath at regular intervals along the route of pipes carrying gasto determine gas concentrations and hence to pinpoint the source of the gas escape. It is a task also widely used throughout the GB gas industry.

Bar holes have two functions, they enable gas that may be trapped to vent to atmosphere and by measuring gas concentrations the source of the gas escapecan be pinpointed and repaired. In the majority of circumstances, higher gas concentrations are normally found nearer the source of the escaping gas.

SGN are looking to develop a more advanced and user friendly innovative solution to undertake small diameter bar holing. However, before a replacement to existing equipment is developed it is necessary for SGN to understand the likely environments bar holing tools will be used, as well as identifying what control measures should be in place and whether there are any design considerations and/or limitations that need to be put in place to operate safely in what is a potentially explosive atmosphere.

Method(s)

Currently there are two methods to enable bar holes to be made within the GB gas industry:

1. The Impact Searcher Bar

This consists of an electrically insulated steel tube which protects users in the event that a below ground cable is spiked which is connected to a retained anvil that is connected to a hardened steel pin. To create a bar hole the steel tube is repeatedly lifted by handand released so that it drops under gravity and impacts onto the anvil which then drives the steel pin into the ground.

The impact force that is available from this device is limited, whichmeans that an impact searcher bar is only effective at penetrating relatively soft ground materials or for penetrating gaps between paving slabs or cracks in footways.In addition once the pin has been driven into the ground it can be difficult to remove it. Considerable force may be required to release it, resulting in high physical stresses tothe users lower back and upper arms.

2. The Rock Drill

Compressed air from a vehicles on-board power, is used to power a rock drill which drives a long shanked carbidetipped drill bit, normally 22mm to 28mm in diameter; this provides both a percussive and a rotational action to penetrate hard surfaces such as concrete and asphalt.The drill bit can become jammed when asphalt becomes heated. It can become wedged on concrete reinforcing mesh or on loose sub base stones where considerable vertical and rotational forces may be needed to release the drill bit from the bar hole.

In cold conditions the Joule Thompson effect caused by the venting of compressed air can cause the rock drill to freeze making the operation of the rock drillunreliable or non-operable without the addition of an anti-freeze additive which is added in line via the compressed air supply.

Rock drills are vibratory tooling and users aresubjected to hand arm vibration (HAV) exposure and so for each user, HAV'sexposure ismonitored and the task of rock drilling is shared to limit HAV's exposure.

Neither of the techniques above are user friendly and both are restricted to operators who are in good health and do not have a HAV's exposure restriction or lower back or upper arms weakness.If these techniques are not used without extreme care, injury can and unfortunately does occur.

To specify a different technique there is a conflict between the perceived requirements of an intrinsically safe drilling machine and the carbide tipped drill bit which readily generates sparks when in operation and is positioned in close proximity to the escaping gas and yet sparking drill bits have not provided a source of ignition on a technique that has been widely used in locating gas escapes within the gas industry for many years.

This project will identify the design requirements for a bar holing tool that is potentially battery powered for use in a potentially explosive environment to enable gas sampling point to be made in a more user friendly process than the two existing methods described.

SGN are currently undergoing discussions with a third party regarding the development of a new non-sparking or intrinsically safe device, which will form part of a Stage 2 project to develop potential solutions upon the conclusions of this project.

Scope

The scope of the project isto carry out a detailed technical, environmental and legislative assessment on the bar hole sampling tools used in the GB gas industry to date and identify the control measures and technical design requirements that can be discussed with a manufacturer in a future Stage 2.

Objective(s)

The objectives of this project is to produce a report detailing a risk assessment for the bar holing activity and the suitability of any powered device to locate and detect gas escapes. The following will be considered within the technical report:

- Assess the likely environment in which the bar hole sampling tool will be used with respect to explosive risk.
- Review the relevant legislation requirements for working in such environments.
- Review the potential implications within the tool design such as battery or air powered tools.
- Identify under what circumstances the battery drill should be prohibited. Such as on medium pressure escapes, where gas can be heard or felt.
- Identify what control measures need to be incorporated into the design of the device and what standards they should comply to.

- Identify any operational control measures which need to be applied to the use of the device.
- Identify if any qualification testing is required to demonstrate product safety in explosive environments.
- Discuss/establish technical requirements for the design with a potential manufacturer.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The success criteria of this project will be determined against the quality and content of the technical assessment. The project will be deemed to be successful if the following outcomes are achieved:

- Delivery of a report detailing the risk assessment for the activity of bar holing and the design requirements for a powered bar holing tool covering all key areas as detailed in the objectives.
- Provide relevant conclusions on the technical requirements that can be used to support a manufacturer in the design and development of a new powered bar holing tool.

The conclusions of this project will support a future Stage 2 project which will look to work with a manufacturer to design a tool that is compliant with the recommendations made in Stage 1.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

This project has been designed to initially carry out a technical assessment report. It was deemed appropriate to limit this project to a small scale study because of the low technology readiness level. SGN have not committed to funding future stages of research and development until the conclusions of this report have been realised.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

The project will be undertaken by MACAW Engineering Ltd at their test facility in Newcastle upon Tyne.

Revenue Allowed for the RIIO Settlement

During RII0-GD1 it is estimated that SGN will spend approximately £255.7m on emergency works. As this project is a technical assessment report for a low technology readiness level, it is not yet possible to determine whether revenue savings are likely.

Indicative Total NIA Project Expenditure

The total project expenditure is £11,716, of which 90% is allowable NIA expenditure (£10,544)

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 solely focuses on the technical assessment of the technology it is difficult to quantify the potential financial benefits at this stage.

It is envisaged that beyond Stage 2, with a new bar holing tool available benefits would be seen in the following areas:

- Reduction in the volume of gas escaping from a rock drill sample hole, therefore resulting in smaller concentrations of natural gas content in the free air environment above ground level. SGNs costs (and carbon footprint) reduced.
- More accurate pin pointing of gas escapes, therefore improving productivity and reducing the time from the moment the gas escape is reported to the time that it has been resolved.

Please provide a calculation of the expected benefits the Solution

This is a research project.

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

The existing two bar holing techniques described are in common use throughout the GB. This project has been designed to develop potential solutions to clearly defined industry challenges. Therefore, this report is the first stage in providing Network Licensees with the requirements to carry out alternative means of bar holing in a potentially explosive atmosphere, as well as identifying what control measures should be in place.

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

There are no costs associated with sharing the conclusions and recommendations of this report with the other Network Licensees, which will be the first step towards roll out across GB. As stated above, the very early technology readiness level 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 from this project as the outputs will be presented in a clearly defined report that will be available to them on request, this will allow the GDN's to make informed choices as to whether to invest in this technology.

The feasibility study will enable new compliant technology to be introduced into the GB gas market to improve how gas escapes are pinpointed.

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

Improved more user friendly techniques to improve the technique of creating gas sample points.

☑ 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