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 2014

Project Reference Number

NIA_NGN_057

Project Registration

Project Title

Tyne Tunnel guided wave trial

Project Reference Number

NIA_NGN_057

Project Licensee(s)

Northern Gas Networks

Project Start

January 2014

Project Duration

0 years and 3 months

Nominated Project Contact(s)

Craig Alderson

Project Budget

£7,182.00

Summary

The method has been successfully used in the off shore oil and gas sectors, but never on the GB gas distribution system. This Project will trial the technology on one particular site, as a precursor to potential further NIA projects on difficult to inspect pipeline applications.

NGN have a limited time window to trial the Method on two intermediate pressure mains running through the pedestrian and cycle tunnel in the Tyne Tunnel. The Project will trial the Method on two lengths of pipe approximately 300m in length.

Dependant on the characteristics of the pipeline In one particular portion and how it responds to the Method, it may be necessary to fit an ultrasonic device permanently with a remote connection, to enable the pipeline to be inspected easily at any point in the future

Third Party Collaborators

TD Williamson

Nominated Contact Email Address(es)

innovation@northerngas.co.uk

Problem Being Solved

Historically UK Gas Networks have had limited means to inspect non-piggable pipelines. Non-piggable pipelines are pipelines where an ‘inspection pig’ could not be used due to obstructions in the pipe (bends) or the lack of provision of ‘pig traps’. In such circumstances the network operator is limited to visual inspection and or localised non destructive testing with an assumption/extrapolation made from these results. These are open to error and misinterpretation and only provide limited information. Additionally the location of the pipeline (river, canal, motorway crossings, and tunnels) can make the logistics and access of any form of existing inspection technique difficult. One specific location is in the Tyne Tunnel where there are two 12” steel pipelines at intermediate pressure where access is extremely difficult and where the impact of failure would be extremely high

Previous licence formulas didn't require GDNs to classify these pipelines. They were either left uninspected or replaced when a problem occurred, but since the introduction of RIIO-GD1, GDNs have a responsibility to replace or risk score their assets.

There are three methods of inspection currently available to NGN to inspect these types of non-piggable pipelines:

Visual Monitoring - Sections of pipeline are exposed and visually inspected. This method can be effective for critical sections but as the pipe needs to be accessible; excavations and removal of wrap must be carried out. Only local external damage or local corrosion can be identified.

Coupon Sampling - This method is a direct sampling method, where a section of pipe is exposed to the same conditions as the line pipe and weighed/examined at intervals. Coupons are usually removed at critical points in the system and should give a 'worst case' result. They will not identify corrosion in a system caused by, for example, external damage. This process is invasive and the removal of samples can inadvertently introduce further risk.

Standard Ultrasonic Wall Thickness Measurement - these measurements are very often used to determine the extent of corrosion, or depth of damage, during pipeline inspection projects. Again, the pipe surface must be exposed for the test to be carried out. Wall thickness measurements at a specific location can be misleading as the results are taken locally and these cannot really give an accurate picture of the condition of the complete length of the pipeline.

Access issues in the Tyne Tunnel including significant encasement of pipework in concrete makes it impossible to use the above techniques, and so there is currently no method of inspecting or objectively risk assessing the pipelines at this location

Method(s)

The Method to use the technique would be as follows:

The Method uses bursts of ultrasound that are fired into the pipe wall material. The ultrasound waves are bounced back by features of interest or faults. Specially developed software enables the user to interpret the information which gives information on the nature and location of the feature enabling information such as pipe wall thickness, corrosion, cracks or design features to be identified.

To use the Method the ultrasound device is clamped at a convenient exposed point on the pipeline. A "shot" ultrasound wave is fired along the pipeline in both directions, (referred to as front shot and back shot). The readings are immediately recorded on to an on-site visual screen where the readings are interpreted. The readings include the length inspected assisting the operator in selecting the location along the pipeline for the equipment to be set up for the next "shot" wave. In best case scenarios one shot may cover up to a kilometre.

On short pipelines only one "shot" will be required using the GUL system (this will be confirmed during the proposed trial). Using guided wave technology, long lengths of pipeline can be screened for corrosion or cracks, with minimal excavation.

The Method is complemented by the other techniques listed in the Problem definition, such that if the Method identifies the locality of an issue, that assuming there is access to that specific point further local investigation can take place.

Scope

The method has been successfully used in the off shore oil and gas sectors, but never on the GB gas distribution system. This Project will trial the technology on one particular site, as a precursor to potential further NIA projects on difficult to inspect pipeline applications

NGN have a limited time window to trial the Method on two intermediate pressure mains running through the pedestrian and cycle tunnel in the Tyne Tunnel. The Project will trial the Method on two lengths of pipe approximately 300m in length.

Dependant on the characteristics of the pipeline In one particular portion and how it responds to the Method, it may be necessary to fit an ultrasonic device permanently with a remote connection, to enable the pipeline to be inspected easily at any point in the future

Objective(s)

The objectives are:

- To conduct a 100% inspection of the Tyne Tunnel pipelines for the first time
- To provide categorised rankings of any tunnel pipeline defects making recommendations either for no action, further investigation or repair
- To validate that the interpretation of Method results as developed in the oil & gas environment translates to the gas distribution network environment
- To understand if the Method has the potential for other NIA projects
- To understand the value or need for the permanent fitment of Method sensors in locations that are particularly hard to access outside the window of opportunity in this Project

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

- Confidence that the total lengths of previously pipelines uninspected pipelines can now be efficiently inspected and more objectively classified for risk
- A report that confirms that all readings obtained by in the trial can be interpreted and all readings can be identified

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The trial will be limited to a single site, and assessment of the intermediate pressure pipelines running through the Tyne Tunnel

Technology Readiness at Start

TRL6 Large Scale

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

The area is confined to the Tyne Tunnel only

Revenue Allowed for the RIIO Settlement

During RIIO-GD1 it is estimated that NGN has a total capital expenditure on pipeline overcrossings of £4m

This technology would be utilized in the vulnerable locations on pipelines and mains.

Assuming that this method would revalidate the tune tunnel pipeline crossing and therefore can be deferred indefinitely using this Method there is a potential saving of approx £250,000 for replacing the gas main.

NGN intend to upgrade 14 pipeline crossings p.a. Assuming an average cost of £25,000 to upgrade an overcrossing and that this technology could avoid costly repairs to 25% of these, then there is a potential saving of £90,000 p.a.

Indicative Total NIA Project Expenditure

The total Project cost is £5400 of which 90% is allowable NIA expenditure (£4860).

NGN external expenditure - £5400

NGN internal expenditure - £1782

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)

There is currently no satisfactory inspection method for the Tyne Tunnel pipelines. Given that the consequences of asset failure in this location would be very high, and the cost of refurbishment (along with significant disruption) would be very high the accurate and objective understanding of the condition of these asset would give significant savings in deferral of asset maintenance and REPEX. The cost of refurbishment of the Tyne Tunnel system is £250,000

Please provide a calculation of the expected benefits the Solution

This is a small scale feasibility study to determine if GUL can be used a method of assessing the condition of steel mains. If the outcome of this trial proves successful we will then be able to calculate financial benefits going in to stage 2.

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

All Network Licensees have assets that are deemed difficult to inspect. The Method could therefore potentially be rolled out across all GB Network Licensees.

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

There would be no up front investment cost in rolling the Method out across GB as the Method would be a bought in diagnostic service on a site by site basis.

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

The end of Project report will be shared with all Network Licensees detailing the performance of the Method, the experiences and knowledge gained from the trial and its limitations, lessons learnt, the range and resolution of the system and examples of successful diagnosis. This will help inform the asset and risk management strategies of other Network Licensees, and inform decision making on other difficult asset inspection problems that the Method could be adapted to or trialled.

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

NGN have approximately 1700 exposed crossings which are classed as vulnerable. Currently they are visually inspected, as they cannot have a traditional above ground survey such as a Close Interval Potential Survey. By utilizing the Guided Wave technology this particular asset can be validated as safe and will effectively re life the pipeline for the foreseeable future. This can avoid costly repairs, which often include scaffolding and heavy machinery.

☑ 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