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 2014

Project Reference Number

NIA_NGN_078

Project Registration

Project Title

Guided Wave Non Destructive Testing Inspection of Mains Pipelines

Project Reference Number

NIA_NGN_078

Project Licensee(s)

Northern Gas Networks

Project Start

May 2014

Project Duration

2 years and 1 month

Nominated Project Contact(s)

NGN – Kristina Brazenaite NGG- Neil Russell TD Williamson – Andrew Little

Project Budget

£173,158.00

Summary

This project is a follow on to the smaller proof of concept trial conducted by NGN in the Tyne Tunnel. The project will encompass a representative number of trial sites and will allow the GUL system to be trialled in a variety of conditions and provide more scope for the confirmation of the results using standard inspection techniques. This project will better inform the networks of the capabilities of the GUL system.

The trial will focus on surveying non piggable steel pipelines in difficult to access areas, a mixture of both sleeve and special crossings sites will be selected.

A report will be produced detailing the operation and results of the trials.

Third Party Collaborators

Energy Innovation Centre

TD Williamson

Nominated Contact Email Address(es)

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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.

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.

An alternative method of inspection is Guided Wave technology. This is a proven technology worldwide, particularly in the oil & petrochemical industry, where it has been used extensively on long lengths of steel non piggable pipelines. However this technique is untested within the UK Gas Networks. NGN have already conducted a proof of concept trial on the gas pipelines in the Tyne Tunnel (Report No – NGN-20012014.006), but more trials are required on a representative sample to give the networks greater evidence that this technique could be utilized by the UK Gas Networks.

Method(s)

The Method is to use the Guided Wave technology supplied by Guided Ultrasonic Ltd (GUL) to survey non-piggable steel pipelines.

The GUL system 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 GUL system 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" may be required (this will be confirmed during the proposed trial) however, there may be scenarios where the condition of the pipe, existence of bolted, lead yarn or other mechanical joints will limit the distance covered. Using guided wave technology, long lengths of pipeline can be screened for corrosion or cracks, with minimal excavation.

The GUL system will be complemented by the current inspection techniques (visual monitoring, coupon sampling, standard ultrasonic wall thickness measurements), such that if the GUL system identifies the locality of an issue, that assuming there is access to that specific point further local investigation can take place.

Scope

This project is a follow on to the smaller proof of concept trial conducted by NGN in the Tyne Tunnel. The project will encompass a representative number of trial sites and will allow the GUL system to be trialled in a variety of conditions and provide more scope for the confirmation of the results using standard inspection techniques. This project will better inform the networks of the capabilities of the GUL system.

The trial will focus on surveying non piggable steel pipelines in difficult to access areas, a mixture of both sleeve and special crossings sites will be selected.

A report will be produced detailing the operation and results of the trials.

Objective(s)

The objectives are:

Prove that the GUL device can be used to inspect difficult to inspect pipelines and reveal new information about asset condition

Conformation that guided wave technology can be transferred from oil pipelines to UK gas pipelines

Demonstrate that the results of this version of a guided wave device can provide a valuable resource to enable the GDN's a greater ability to reclassify pipelines to conform with RIIO GD1

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Confidence that the total lengths of previously uninspected pipelines can now be efficiently inspected and more objectively classified for risk

Evidence that the GUL method provides a cost effective, non-obtrusive inspection technique

Evidence that the method can reduce savings in excavation and reinstatements

Confidence that all readings obtained by this technique can be interpreted

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

This project is to be undertaken as a single stage 8 month project, split into 2 phases using two networks. The number of sites to be used is to provide a meaningful representative sample.

Phase 1. A selection of up to 20 sites, a mixture of both sleeves and special crossings, all locations will be selected in GDN network 1.

Phase 2. A selection of additional 20 sites, again a mixture of sleeves and special crossings in GDN network 2. Phase 2 will only be undertaken on successful completion of phase 1.

Technology Readiness at Start

TRL7 Inactive Commissioning

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

Trials will be on a number of diverse situations across the NGN and NG footprint covering asset locations (but not limited to these locations)

Sleeved Assets

River Overcrossing

Tunnelled Assets

High Risk Urban Location

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.

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, and then there is a potential saving of £90,000 p.a

Indicative Total NIA Project Expenditure

The total recoverable allowance will be 90% of the project costs shown below for each Licensee under the Network Innovation Allowance (NIA): NGN External expenditure - £43,333.33 Internal expenditure - £14,386 Total NGN expenditure - £57,719 NGG External expenditure - £86,666.66 Internal expenditure - £28,773 Total NGG expenditure - £115,439 Total NIA expenditure - £173,158

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 a large number of difficult to access high risk assets (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 these type of asset could range between £50,000 and £250,000. This technique has the potential to save on conventional inspection techniques or invasive inspections.

Please provide a calculation of the expected benefits the Solution

This project successfully trialed the GUL inspection tool on 4 trial locations on one of the 12 inch natural gas steel pipelines in the Tyne Tunnel. The tool could be used in relatively confined spaces and the report illustrated areas of concern. Further inspections are required for one of the locations, which the inspection tool showed to be an area of concern.

The initial field trial base cost was £1500.00 for four point assessment that has the potential to remove £250,000 exposure costs.

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.

It is envisaged that each Network would have at least one difficult to access or costly exposure assessment to make which could remove a similar amount to that encounted in the feasibility study.

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

Due to the high level of interpretational and analysis skills required the Method would be a bought in diagnostic service on a site by site basis. There would be no upfront investment cost in rolling the Method out across GB as networks could choose this service, an alternative service or technique based on commercially available rates at the time. By trialing and demonstrating this technology it provides an alternative commercially available service that will have the potential to reduce all rates in assessing these assets.

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. The challenge within NGN's Innovation Strategy is effective asset management removing the need to replace assets if they can be demonstrated that they are still fit for purpose and not at the end of their asset life.

☑ 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