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NIA Project Registration and PEA Document

Date of Submission

Feb 2020

Project Reference Number

NIA_NGN_253

Project Registration

Project Title

Overcrossing Sleeve Investigation Tool

Project Reference Number

NIA_NGN_253

Project Licensee(s)

Northern Gas Networks

Project Start

February 2020

Project Duration

0 years and 9 months

Nominated Project Contact(s)

Chris Bates

Project Budget

£124,698.00

Summary

The Manufacturing Technology Centre (MTC) were asked to propose an investigation into whether any NDT inspection methods are suitable for determining if fill material is present inside these buried gas pipe sleeves. Ideally the solution should also be able to provide some data on the degree and/or location of any corrosion.

Third Party Collaborators

Manufacturing Technology Centre

Nominated Contact Email Address(es)

innovation@northerngas.co.uk

Problem Being Solved

Metallic gas pipelines within the UK distribution network often require additional protection when situated in high-load locations. In order to extend pipeline lifetime and protect against external damage, metal 'sleeves' were installed, especially during the 1960s and 70s, to surround these pipes, with an annulus, or gap, between the pipe and sleeve.

Since the installation of these sleeves, the problem of water ingress has been mitigated through filling the sleeves with nitrogen or alternatively, sleeve annuli have been retrospectively filled with cement (or other grouting material) to prevent air or water access. However, identifying sleeve regions that have received this treatment has proven to be a challenge, in part due to poor records and documentation. The only current means of determining whether sleeves have been grout-filled (and the condition of the grout) and subsequently, the condition of the sleeve, is to undertake expensive and time-consuming excavation works. Therefore, a new, less intrusive, method for assessing whether sleeves have been 100 % filled is required.

Method(s)

The Manufacturing Technology Centre (MTC) were asked to propose an investigation into whether any NDT inspection methods are suitable for determining if fill material is present inside these buried gas pipe sleeves. Ideally the solution should also be able to

provide some data on the degree and/or location of any corrosion. The intent would be to replace the current inspection method, which involves costly and disruptive groundworks. Pipelines are typically 11-60 cm in diameter, with an average sleeve section length of 42 m and buried depth of 1.1 m. Both pipelines and sleeves are typically manufactured from carbon steels.

The project will be delivered in an agile methodology, following the MTC's proven process. This will include gated reviews and opportunity to review the project at appropriate stages, should the outcomes not be technologically achievable, in doing so reducing risk and exposure to both parties.

Scope

The MTC propose to use an extensive down-selection process to identify the most appropriate technique to identify the filled/unfilled condition inside buried metal sleeves and to establish whether it would be possible to identify the degree of corrosion of the carrier pipe.

The first deliverable will review current practices, outline problem areas observed and identify the level of detection the gas network wish to achieve, taking into account practical limits, such as the depth and locations of buried pipes. From this, the key technological requirements will be clearly defined.

Following this stage, an assessment of the capabilities of technologies that could potentially solve the challenge will be carried out. A weighted Pugh matrix framework, together with practical considerations for each technology, will inform the most appropriate solutions. The most appropriate technologies will then be trialed on a representative component provided by the gas networks, in order to validate its performance.

The final element will be Field Trials for proof of concept on a maximum of two technologies on representative scenarios within NGN's network or equivalent.

Experimental results and recommendations from the actual field trials will be presented in the fourth deliverable of this project, along with recommendations on the next stages of the project. It should be noted that NGN are looking for a working solution. It is therefore envisaged that the next stage of the project will be a Development and Extensive Field Testing and User testing phase to rapidly look to progress to this outcome.

Objective(s)

1. Define the key project requirements;
2. Undertake a paper-based down-selection to identify the most appropriate; inspection systems out of all identified, to progress to inspection trials;
3. Conduct initial laboratory trials of up to two of the most likely identified technologies on representative pipe samples / rig;
4. Conduct validation field trials of up to two of the most likely identified technologies on representative buried gas pipelines;
5. Report findings and recommendations of the inspection system.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Highest level success criteria will be a prototype provision of a working solution (product or service) meeting the key requirements. In essence these have been agreed through the Project Terms of Reference MOSCOW section as:

- Process to be less invasive;
- Output to be interpretable by gas operatives;
- Rugged and suitable for operational environment;
- Output to meet the current tolerance standards applicable to 'piggable' pipelines;
- Output to identify sleeve filled condition;
- Confirmation as to whether it is possible to determine asset integrity information; and if is whether data is meaningful and can support next steps decision making.

Project Partners and External Funding

Northern Gas Networks - £124,698
MTC - N/A

Potential for New Learning

The introduction of this new potential NDT methodology would be an industry first to identify pipe sleeve fill material through a non-invasive manner. If successful, this would be a new process for the industry and therefore will be new to the industry. Should for whatever reason it be unsuccessful, then this is also new learning, as it would mean that the current problem statement could not be met through current known NDT practices.

Scale of Project

The project will develop up to two proof of concept technologies, trialed on representative scenarios within NGN's network. The scale of the project is reflective of the minimum requirements to determine the feasibility of developing the prototype technologies into a final

commercially ready product.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

The project will take place within Northern Gas Networks geographical boundaries.

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

External funding = £116,700

Internal cost = £7,998

Total Cost = £124,698

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 project is a research and feasibility study to prove the viability of NDT technology. However, it is estimated such technology could save several £tens of thousands, comparatively to excavating and manually inspecting the sleeve.

Please provide a calculation of the expected benefits the Solution

This project is a research and feasibility study.

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

The challenge being addressed by the solution is applicable to all GDN's and therefore could be readily adopted across the GB gas network.

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

This project is a research and feasibility study. The outline cost will seek to be understood in a next phase project, should this phase prove successful.

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

GDNs have an asset class of metallic pipeline sleeves. Like all gas distribution assets, these require managing throughout their lifecycle to ensure ongoing safety and efficiency. The project, if successful, could allow all GDN's to inspect the makeup and condition of their sleeves through an NDT technology.

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.

No current solution exists within the gas industry.

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

The project intends to address a specific GDN challenge around grout filled sleeves. NDT has not previously been utilised for this application, nor is it known the type of NDT technologies capable of solving the challenge, if at all.

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

The uncertainty surrounding the technical feasibility of the intended end solution, presents a commercial risk to NGN, that would be

beyond its current risk appetite.

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

NGN cannot be certain the project will deliver a viable end solution, capable of achieving operational compliance. It is this uncertainty that is considered beyond NGN's risk appetite at the specified level of investment to progress as a business as usual activity.

This project has been approved by a senior member of staff

Yes