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

Jun 2019

Project Reference Number

NIA_SGN0151

Project Registration

Project Title

Sleeve Assessment Technology – Phase 1

Project Reference Number

NIA_SGN0151

Project Licensee(s)

SGN

Project Start

July 2019

Project Duration

1 year and 9 months

Nominated Project Contact(s)

Keith Ellison Innovation Project Manager

Project Budget

£531,614.00

Summary

All Gas Distribution Networks (GDNs) in the United Kingdon (UK) have high pressure gas pipelines that are sleeved (the carrier pipe which the live pipe sits in) to protect them in locations where they cross third-party infrastructure such as railways, rivers and roads. These sleeves were installed in accordance with IGEM/TD/1 (Steel pipelines and associated installations for high pressure gas transmission) to protect pipelines from any point loads or conditions which could potentially impact their integrity; however, with the implementation of IGEM/TD/1 edition 3 these were no longer permissible.

The condition of these sleeves has been problematic to quantify, and it has been envisaged that sections of sleeved pipeline could be exhibiting significant levels of corrosion. Due to the age of the pipeline, pipeline coating and end seals, water ingress can occur inside the sleeve and external corrosion on the gas pipeline can initiate and accelerate. It has been identified that there is a higher risk of external corrosion on the pipeline located in a sleeve.

SGN has approximately 600 Air Filled Sleeves currently in operation on Scotland's Local Transmission System (LTS). Within this population, approximately 116 of these are on pipelines that Inline Inspection (ILI) cannot be performed but require inspection (condition assessment) as a regulatory requirement, these are a known as OLI/4 Pipelines. Moreover, a further 484 OLI/1 sleeved pipelines with limited condition data.

Current inspection methods require extensive excavation works to dig out the pipe, remove the sleeve and visually inspect it, which are often costly, time-consuming and a resource burden on the GDNs. In June 2003 Advantica Report R6196 was produced which provided a risk assessment methodology for OLI4 pipelines contained within Air-Filled Sleeves. This report made a number of recommendations as to how potentially make a desktop assessment to select which pipelines should be exposed and inspected. Since this time sleeves have undergone a limited number of condition assessment since this was published and recommended as the overall cost is extremely prohibitive.
A means of inspecting the sleeves without the need to excavate would greatly simplify the process of assessing these sleeves, limit interference and inform any future action taken by the networks.

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

All Gas Distribution Networks (GDNs) in the United Kingdon (UK) have high pressure gas pipelines that are sleeved (the carrier pipe which the live pipe sits in) to protect them in locations where they cross third-party infrastructure such as railways, rivers and roads. These sleeves were installed in accordance with IGEM/TD/1 (Steel pipelines and associated installations for high pressure gas transmission) to protect pipelines from any point loads or conditions which could potentially impact their integrity; however, with the implementation of IGEM/TD/1 edition 3 these were no longer permissible.

The condition of these sleeves has been problematic to quantify, and it has been envisaged that sections of sleeved pipeline could be exhibiting significant levels of corrosion. Due to the age of the pipeline, pipeline coating and end seals, water ingress can occur inside the sleeve and external corrosion on the gas pipeline can initiate and accelerate. It has been identified that there is a higher risk of external corrosion on the pipeline located in a sleeve.

SGN has approximately 600 Air Filled Sleeves currently in operation on Scotland's Local Transmission System (LTS). Within this population, approximately 116 of these are on pipelines that Inline Inspection (ILI) cannot be performed but require inspection (condition assessment) as a regulatory requirement, these are a known as OLI/4 Pipelines. Moreover, a further 484 OLI/1 sleeved pipelines with limited condition data.

Current inspection methods require extensive excavation works to dig out the pipe, remove the sleeve and visually inspect it, which are often costly, time-consuming and a resource burden on the GDNs. In June 2003 Advantica Report R6196 was produced which provided a risk assessment methodology for OLI4 pipelines contained within Air-Filled Sleeves. This report made a number of recommendations as to how potentially make a desktop assessment to select which pipelines should be exposed and inspected. Since this time sleeves have undergone a limited number of condition assessment since this was published and recommended as the overall cost is extremely prohibitive.
A means of inspecting the sleeves without the need to excavate would greatly simplify the process of assessing these sleeves, limit interference and inform any future action taken by the networks.

Method(s)

This project follows on from a study by the United Kingdom Onshore Pipeline Operator's Association (UKOPA) that was commissioned in 2016 jointly by all the GDNs. The study reported that surveys will need to be carried out on each sleeved pipeline site to understand existing sleeve conditions, current levels of corrosion and accessibility to determine the type of remedial works which should be performed. At present, there is no means of inspection for SGN other than to carry out extensive excavation works, which are costly, time-consuming and a resource burden.

The objective of Phase 1 of this two-phase project is to undertake the design, fabrication and field testing of a vent line inspection tool and asset management prioritisation decision support tool for pipelines with air filled sleeves. Successful development of this innovative technology will enable GDNs to manage sleeved assets more efficiently. This project has been split into two phases that will run consecutively. Phase 1 will be executed as a series of tasks, as highlighted below:

Phase I – Vent Line Inspection Tool

- Task 1: Project Kick Off
- Task 2: Specifications research and development & decision support tool developed
- Task 3: Conceptual Design
- Task 4: Detailed Design
- Task 5: System Integration
- Task 6: Offsite Field Testing
- Task 7: Live Field Trials
- Task 8 : SGN Operative Training
- Task 9: Reporting Summary and System Modifications

The completion of Phase 1 will allow SGN to assess the pipelines condition and integrity of their sleeved population allowing informed decisions to be made on these assets. This data will then determine whether the development of a sleeve inspection robot (Phase 2) is beneficial in order to undertake detailed inspections inside the sleeve while navigating past debris and other obstructions.

Scope

The scope of this project is to design and develop a vent line inspection tool that is capable of launching into 2" vent lines and navigating through multiple 90-degree bends to reach the sleeve. The device will be capable of extracting a water sample from within the sleeve which can subsequently be tested on-site for the presence of corrosion. This capability will enable SGN to rapidly and affordably assess pipe condition and determine whether further inspection is required.

A decision support tool for managing sleeves integrity will also be developed to enable SGNs Asset Management team to categorise the findings and to establish the next course of action.

The completion of Phase 1 will allow SGN to assess the pipelines condition and integrity of their sleeved population allowing informed decisions to be made on these assets. This data will then determine whether the development of a sleeve inspection robot (Phase 2) is beneficial in order to undertake detailed inspections inside the sleeve while navigating past debris and other obstructions.

Objective(s)

The objectives of Phase 1 of the project is to develop a vent line inspection tool and decision support tool that will enable SGN operatives to rapidly evaluate the corrosion levels inside of sleeves.
Summary of the work required:

- Carry out design and development works associated with the vent line inspection tool.
- Develop a working prototype vent line inspection tool to meet the relevant industry standards and specifications.
- Develop a decision support tool that also meets the relevant industry standards and specifications.
- Deliver training to SGN operatives on the use of the vent line inspection tool.
- Trial across SGNs regional network.
- Commercial appraisal for the overall use of the products and potential benefits realised from the asset management decision making process.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The success criteria for the project will be reviewed against the following criteria:
Vent Line Inspection Tool

- The ability to travel around multiple 90-degree bends.
- The ability to travel in 2" (or associated space) vent lines and capture live video footage.
- Determine the travel distance of the inspection tool.
- Entry into the vent line and collect a water sample from the pipeline sleeve.
- Provide SGN operatives with a user-friendly device that they can be trained to use and deploy within a live environment.
- Confirm other applications where the technology could be applied throughout the network.

Decision Support Tool

- Accurate and informed data is gathered, allowing more informed asset integrity decisions to be made.
- Allows for longer term prioritisation, Asset management whilst demonstrating the adequate level of compliance as assurance against our legislative safety obligations.

Project Partners and External Funding

The project partners are ULC Robotics and Steer Energy.

Potential for New Learning

It is expected that this project will provide all network licensees with an understanding of the newly developed vent line inspection tool and decision support tool, with an aspiration of providing more accurate and better-informed asset management decisions to be made, based on the data gathered.

The project will provide learning on the functionality and applicability of the technology.
Learning will be disseminated by providing training to operatives and through reports produced throughout the project.

Scale of Project

This project has been initially designed to undertake the design, development and field trial of the Inspection tool for deployment into the vent lines and the extraction of the water sample that will be analysed. In addition, a decision support tool will be used in conjunction with the vent line inspection tool to establish the next course of action.
The field trials will take place across SGNs Scotland network and a variety of pipeline sleeved assets will be selected in order to assess the various parameters of interest.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

The project will be trialled in Scotland across a variety of field trial sites.

Revenue Allowed for the RIIO Settlement

SGN's RIIO Allowance for Repair activities is £209.6m. Given that the Project is successful and identifies that a number of these sleeves do not require excavation it is likely that there could, potentially, be a reduction in the repair expenditure. It is envisaged this would be down to material costs, excavations, although this will become clearer as the Project progresses.

Indicative Total NIA Project Expenditure

The total project expenditure is £530,614 90% (£477,552) of which will be recovered via the NIA funding mechanism in line with the funding conditions.

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)

All Networks follow Pipeline Safety Regulations Compliance & UKOPA Guidelines the learning from this project will be shared across the relevant parties. The savings for a single sleeve inspection utilising current techniques equates to £120,000 it is envisaged that if this project is successful the cost of a single inspection will be approximately £4,200 giving a saving of £115,800 per inspection. Current method inspection costs pipeline danger zone- hand dug excavation £30,000 plus standardised engineering costs to access the pipe & expose seals / make cuts £90,000 total £120,000.
New project inspection method costs total £4,200 therefore single saving of £115,800

Please provide a calculation of the expected benefits the Solution

n/a

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

The costs for inspection will be similar across the Networks due to hand excavations and exposure of the end seals

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

The learning from this project will be shared and the individual networks will be able to implement the learning form this project

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

☐ 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 for dissemination.
The learning gained from this project aims to inform Network Licensees of the potential of a solution to initially assess the condition assessment of pipeline sleeves.

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.

A review of the Smarter Networks Portal and other Network License's Annual Reports was performed prior to the start of this project and no similar projects were identified.
The network licensees were also made aware of this project through collaboration meetings.

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

Currently there is no known method of assessing the sleeves without the need for excavations and cutting of the end seals. This project proposes to develop a vent line inspection tool that will enable SGN operatives to rapidly evaluate the corrosion levels inside of pipeline with air (unintended water) filled sleeves. This system will travel through 90-degree bends (up to four) in the sleeve vent line while capturing live video of the vent line and the annular space between the sleeve and the carrier pipe.

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

This project aims to address long term issues of inspection of pipeline sleeves and utilising a vent line inspection tool which will be a novel approach to assess the condition.

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

The networks do not have the technical capability to or ease of access to the required information to undertake the project

This project has been approved by a senior member of staff

☑ Yes