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

Apr 2017

Project Reference Number

NIA_NGN_205

Project Registration

Project Title

System Two Assess and Seal System (STASS)

Project Reference Number

NIA_NGN_205

Project Licensee(s)

Northern Gas Networks

Project Start

April 2017

Project Duration

2 years and 1 month

Nominated Project Contact(s)

Patrick Horton, Richard Hynes-Cooper

Project Budget

£998,000.00

Summary

The scope of the project is to;

(1) Undertake the design, development, manufacture and testing of a new Synthotrax IRV that can bring together visual, location, and sealant systems.

a. Development of the Synthotrax platform to include spray head and CCTV

b. Development of the Sealant injection system to increase injection length from 40m -50m to 130m

c. Field Trials to confirm TRL 6, 7 and 8

d. Manufacture of TRL8 Synthotrax

(2) Maximise the use of the ALH Bond and Bolt and Synthotech Key hole vertical access systems and encirclement clamps to minimise the number and size of excavations.

(3) Determine impact on Standards and operating procedures

a. Review and Gap Analysis

b. Support generation of G23

c. Technical reporting on the joints and connections sealed during the trials

Third Party Collaborators

SynthoTec Ltd

Nominated Contact Email Address(es)

innovation@northerngas.co.uk

Problem Being Solved

Northern Gas Networks (NGN) are required under Rep 2 Appendix C required to manage their Tier 2 (a&b) and Tier 3 networks. NGN have 1,700 km of Tier 2 and 3 assets and as such interaction such as repair or assessment is expensive. There are three key drivers for intervention in relation to these assets; leakage, proactive risk management, confirmation of as laid data.

During 2015 NGN carried out in excess of 1100 repairs to their large diameter mains with the majority of repairs for leaking joints. THe largest population within the Tier 2 to 3 range was 12", 18" and 24" with associated repair costs being circa £5m. This project will look to address the stated size range of 10" to 48".

Method(s)

NGN are looking to address the above three drivers to improve how they can proactively manage their Tier 2b and Tier 3 assets. This is as part of risk management, the treatment of joints and connections will not lower the risk model but will provide NGN with greater management information, with the added benefit of being able to treat the joints and connection buy utilising and enhancing three existing tools and techniques

(i) Leakage – the largest proportion of network leakage occurs from joints on metallic gas mains. This is the gas transporters' biggest impact on the environment and is reflected in the networks' shrinkage declarations. Methane, the primary component of natural gas, is around 21 times more harmful than carbon dioxide (CO_2) and lost gas per annum across all the distribution networks has a carbon equivalent of 4.56Mtonnes of carbon dioxide equivalent (CO_2e). The current method of repairing gas main joints requires a separate excavation on each joint which is both costly and causes considerable disruption to the public, particularly road users. The proposed evolution of three key pieces of technology will offer significant reductions even based on an initial approach to seal all joints and connections. The reason for sealing all joints and connections initially is based on maximising the opportunity from the excavation with up to 64 joints or connections sealed from a point of entry (256m).

(ii) Proactive Risk Management – NGN are already using technology to proactively manage risks on their larger diameter mains, at present the repairs to the Tier 2b & Tier 3 assets are reactive, dealing with leaks or issues as they are identified. There is a desire to more proactive, this proposed development would be the first step in combining other leak detection technologies to only treat joints and connections based on either confirmation there is a leak or if statistical data generated identifies other areas for proactive repair. The is a distinct driver to understand the potential costs of managing the larger assets during GD2, this project will help inform the models as these should provide up to 2 years of operational data.

(iii) Validation of as laid data – NGN want to increase the information that have on their GIS data base on the as laid mains. There is a desire have a balance of visual data and location data to better inform the models looking for trends that relate to the number of joints / connections per pipe length (Short and Long), the location of joints (accuracy of 10cm) and also depth of mains.

The above problem definition is one that all GDN's are seeking to address as a result there are a number of other methods that either have been or are being developed to support the above. With this NIA project NGN are looking to approach their problems in a different method to these other technologies with key focus being using three existing and well established technologies – (1) Synthotrax Intelligent Robotic Vehicle (2) ALH Bond and Bolt Technique and (3) ALH Main / Flex-spray LC12 sealants. There are a number of other key technological differences in this project which are covered in this submission.

NGN will be working with a UK SME (Synthotech Ltd), based within in their operational network with a proven track record of delivering innovation and collaborating with other companies from within their technology hub. This project will aim to bring together 'best of breed' to provide a cost effective solution that allows the technology to be used on a significant scale due to a primary benefit of a proactive treatment of all joints and services of Tier 2b and Tier 3 pipes, and secondary benefit of providing valuable assets information and data collection on the internal condition and geometric data.

The project will look at enhancing / utilising four existing TRL8/9 solutions;

1. Synthotrax Intelligent Robotic Vehicle – Suitable for vertical 'live' launch through key hole technology
2. ALH Bond and Bolt – Method of accessing larger diameter mains without the need to fully excavate the large diameter main
3. ALH Main Spray system and sealant – Currently used but with limitation on length up to 40-50m max from one point of entry, allowing joints to be sealed. This technology has very limited push distances in mains beyond 18" less than 25m.
4. Location technology – Use of off the shelf technology such as WinCam, Sonde and Location devices to interact with the Synthotrax system

As stated the project differs from other NIA / NIC's or known developments the key technical differences are;

(a) Disturbance and movement of joint debris

(b) Spraying of In-pipe features – e.g. Plugs

(c) Access Hole Size – Keyhole (20" and Above – Vertical 6" Mains drilling)

(d) Non-drilled application of sealant and low pressure delivery system

(e) Development of system that can be operated by NGN direct labour teams to maximise cost benefit – e.g. Non-contracted

(f) Low pressure only – ≤75 mbar

(g) Understand the challenges with rehabilitating previously anaerobically sealed joints or connections

NGN want to be able to upskill their operational teams to undertake the works in a planned approach this means that the technology that is developed will need to consider the operational challenges and end user interfaces. This is significantly different from a solution that was to be only offered as a 'specialist service', and Synthotech have in recent years focused heavily on providing products rather than services.

The project will also look to share in the learning from other NGN NIA projects (186, 202 and 171), there is also driver in the project for other GDN's to share their learning from other projects that could compliment this development in future. This will be a key output from the project which is very much seen as a series of developments to prove, embed, monitor and develop the tools that can be carried by the Synthotrax IRV e.g. leak detection technology and automatic component detection.

The project will not be looking at providing savings only this will look at the benefits this brings to the toolbox of techniques which NGN has and can use in their asset management approach. There is clear focus on maximizing technology to better inform and manage the assets in the current regulatory period and beyond into GD2. This approach should provide valuable qualitative and quantitative data for use in better understanding the management of the Tier 2b / 3 asset that are not currently planned to be replaced.

Scope

The scope of the project is to;

(1) Undertake the design, development, manufacture and testing of a new Synthotrax IRV that can bring together visual, location, and sealant systems.

a. Development of the Synthotrax platform to include spray head and CCTV

b. Development of the Sealant injection system to increase injection length from 40m -50m to 130m

c. Field Trials to confirm TRL 6, 7 and 8

d. Manufacture of TRL8 Synthotrax

(2) Maximise the use of the ALH Bond and Bolt and Synthotech Key hole vertical access systems and encirclement clamps to

minimise the number and size of excavations.

(3) Determine impact on Standards and operating procedures

a. Review and Gap Analysis

b. Support generation of G23

c. Technical reporting on the joints and connections sealed during the trials

Objective(s)

The primary objectives will be to provide the necessary products and process to allow innovative and alternative method for to allow the sealing of joints in Tier 2 and Tier 3 mains. This will include the following defined outputs:

Stage 1: Laboratory testing of the complete system – TRL6 – 4 Months

- Development of existing Synthotrax platform to allow the deployment of sealant up to 130m from access point
- Demonstration in as bench top / laboratory system (non-gas)

Stage 2: Field trial testing of the complete system – TRL7 – 4 Months

- Development of the Stage 1 system for use in a simulated operational environment
- Demonstration in a simulated environment
- Generation of Risk Assessments and Method Statements for progression to Stage 3

Stage 3a: Mobilisation – TRL8 – 4-6 months

- Field Trials in working environment
- Training and Skills assessment
- Support of standards and approvals
- Technical Approvals
- Support of G23 Field Trial documentation
- Assess drilling sizes for T2 and T3 mains e.g D/4 vs D/3.33

Stage 3b: Feasibility Study for potential future development

- Identify and assess the potential for ‘bolt on technology’ e.g. Leak Detection
- Options for Key hole 12” to 18”
- Review potential Bond for permanent access fittings to allow future periodic inspections at lower costs
- Understand statistical information to inform GD2

Stage 4: Technical & NIA closure report (2 Months)

- Generation of data folders
- Collation of trials data
- Review of data management protocols for embedding in existing IT infrastructure

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project is deemed successful if, the products and end to end processes are developed that;

- Meets the requirements of the project objectives
- Achieves technology readiness level as detailed in the project scope

Project Partners and External Funding

The project is fully funded by the NIA mechanism

Northern Gas Networks

Synthotech Ltd

Potential for New Learning

(1) Better understanding of the as laid pipe condition and configurations to better inform GD2 asset management strategy

(2) Development of statistical information on the number joints and connection per m on Tier 2a and 3 Mains

Scale of Project

The project will be conducted under controlled conditions (G23) and as a result there will be a limited number of trials (max 10 off entry points). This approach is designed to prove the technology is TRL8 in that is works as a non-contracted service in real operational environment and that the work to commericialise (TRL9) is fully understood based on documented evidence.

Technology Readiness at Start

TRL5 Pilot Scale

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

The technology will be trialled across the NGN network, once developed the technology will have the potential to be used across the UK gas industry.

Revenue Allowed for the RIIO Settlement

We are likely to see our ROI of this project in 2019/20, where under our RIIO forecast for repairs we estimate on spending £16.9M of our allowed revenue.

Indicative Total NIA Project Expenditure

Internal costs – £216,666

External costs - £650,000

Total Project costs - £866,666

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)

NGN estimate the project has the potential to repair reduce current operational costs associated to large diameter mains PRE's by circa 5% in years 7 and 8 of RIIO. In additional there are significant customer, stakeholder and environmental benefits with this project due to reduced size of excavations and associated spoil transfer to land fill and also the reduced duration of occupation of the highway.

This project is not being undertaken purely based on savings, it is about enabling NGN to potentially increase the level of Tier 2b/ 3 management and assessment it undertakes. This will maximize the benefit to the customers in a number of ways.

Please provide a calculation of the expected benefits the Solution

It is estimated if developed successfully to meet 100% of the scope and objectives that NGN could use this technology up to 100 times with savings in the region of £5k per operation this could provide the project with a break even return on investment by 2021.

It is estimated that this technique could be used on 30-50% of the current work load with the single system that will be developed during the project.

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

This is an estimate for NGN's network, by using the ratio of 4:2:1:1 for the other networks the potential savings for the UK are significant of both quantitive and qualative nature, this will very much depend on the utilization and commercial arrangements that they may currently have with alternative technology.

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

We are unable to provide an estimated roll out for this technology at this initial submission but it estimated that this could be rolled out in 2019/2020.

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 problem addressed by this project is industry wide and will offer alternatives to currently available technologies to all network licensees with the focus being on non-specialist services with associated data to inform Asset Strategy decision making.

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

This will address and support both operational and innovation focus areas for the use of proactive Tier 2/3 asset management as well as inform future GD2 strategies.

☑ 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 detailed assessment of currently available technology and this project will not duplicate work already undertaken by network licensees. This is an innovative approach to deliver 'best of breed' by combining existing proven technology to resolve operational limitations and extend the use of robust and safe method of inspection and sealing practices.

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

.

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

.

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

.

This project has been approved by a senior member of staff

☑ Yes