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

Oct 2020

Project Reference Number

NIA_NGN_261

Project Registration

Project Title

Live & Dead Check Analyser

Project Reference Number

NIA_NGN_261

Project Licensee(s)

Northern Gas Networks

Project Start

October 2020

Project Duration

1 year and 6 months

Nominated Project Contact(s)

Andrew Simcoe

Project Budget

£156,805.00

Summary

The number of electrical cables being inserted within old ‘abandoned’ steel gas pipes in commercial dwellings is on an upward trending curve. When gas engineers are tasked to perform a ‘live/dead check’, they have no means of knowing whether an electrical cable, or other unknown elements are present in the gas pipe they are operating on, and more importantly if a cable is present, if it is energised or not. The risk of undertaking this operation is significant and potentially dangerous for the field operatives, who are susceptible of being electrocuted in the presence of an energised electrical cable.

Third Party Collaborators

Energy Innovation Centre

Mage Control Systems Ltd

Nominated Contact Email Address(es)

innovation@northerngas.co.uk

Problem Being Solved

The number of electrical cables being inserted within old ‘abandoned’ steel gas pipes in commercial dwellings is on an upward trending curve. When gas engineers are tasked to perform a ‘live/dead check’, they have no means of knowing whether an electrical cable, or other unknown elements are present in the gas pipe they are operating on, and more importantly if a cable is present, if it is energised or not. The risk of undertaking this operation is significant and potentially dangerous for the field operatives, who are susceptible of being electrocuted in the presence of an energised electrical cable.

Method(s)

Mage Control has recently developed unique technology for the detection of voltage and current state in three phase armoured cables. The detection method used would be adapted to work with legacy and modern gas pipes for the discrimination of embedded cables. The detection of gas pressurised pipes, and also discrimination of these from water pipes can potentially be facilitated using a number

of measurement techniques. The cable detection and characterisation work by complex field vector magnetometry. The development of a method to discriminate contents of the pipework gas/air/water may be determined by applying a novel adaptation of proton precession magnetometry.

The project will be delivered in 5 stages:

- Stage 1 – Feasibility assessment and Lab Testing
- Stage 2 – Development of Initial Prototype
- Stage 3 – Prototype Field Trial
- Stage 4 - Manufacturing and Commercialization Roadmap
- Stage 5 - BAU Business Case

Scope

The project intends to deliver 10 prototype hand tools that are proven to be able to detect live cables within iron, steel and PE gas pipes ideally up to 12" with 100% accuracy whilst also being able to distinguish if they are 'live' I.e. containing a pressurised medium (water or gas) or 'dead' i.e. disused.

Objective(s)

The project objectives will be delivered within the 5 stages of the project.

Stage 1 – Feasibility assessment and Lab Testing
Work to adapt and develop the larger sensor array for the current Mage cable tester to measure electromagnetic fields, through iron, steel, and PE gas pipes from 2" up to 12".
Lab test a range of methods to measure gas pressurisation in the gas pipes and test a range of techniques to discriminate between water pipes and gas pipes, using the following methods:

- Ultrasonic measurement for gas pressurisation
- Acoustic Measurement
- Proton precession magnetometry for gas pressurization

Stage 2 – Development of Initial Prototype
Develop the initial prototype for field trial testing with a testing schedule.

Stage 3 – Prototype Field Trial
Undertake field trials to prove the reliability of the too and iteratively improve the prototype design.

Stage 4 - Manufacturing and Commercialization Roadmap
Commercialisation road map – produce a road map for transforming the final prototype design to a commercialised product consisting of final design for manufacture.

Stage 5 - BAU Business Case
Using the findings from the trial and commercialization roadmap to build a business as usual business case for deployment.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

For the project to be deemed as successful the following success criteria must be met:

- The tool must operate on 1" up to 12" of pipe diameter.
- The tool must provide 100% accuracy detection of live cables
- The tool must provide 90% accuracy of pipe stats and contents (i.e. pressurized gas or water)
- The tool must be easy to operate and interpret
- The tool must allow for selection of different pipe materials
- The tool must have Bluetooth connectivity capabilities.
- The tool must have acceptance sign off (G23)

Following on from Field Trial feedback and final designs. There will be a full 'train the trainer' package delivered with the 10 final prototypes.

Project Partners and External Funding

Northern Gas Networks
EIC
Mage Control

Potential for New Learning

This project will identify:

- Detection of live cables within decommissioned gas pipes
- Detection of gas pressurisation status
- Discrimination of water vs gas pipes

Scale of Project

After the initial feasibility assessment and lab testing, the project will develop an initial 5 prototype hand tools which will be used for field trials to gather data and feedback. The final stage will manufacture 10 prototype hand tools, train the trainer packages for roll out and a business case to enable implementation of the tool within the network.

The scale of the project is reflective of the minimum requirements to demonstrate and gain assurance, such that the product is effective in an operational environment.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

The project will be constrained to the Northern Gas Networks Network.

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

External funding = £130,000
Internal cost = £26,805

Total Cost = £156,805

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)

The benefits of this project are efficiency and safety. The tool will enable efficient identification of unknown buried assets, this will improve maintenance/repair times and prevention of gas/water leakage from drilling.
The safety benefit will prevent accidental electric shock/electrocution which will reduce the loss time injuries, cable strike resource for investigation and 3rd party damages.
The aim of the tool is to provide safety and assurances for our operational colleagues.

Please provide a calculation of the expected benefits the Solution

It is estimated the project will deliver £20,000 a year net benefits, based on prevention of 3rd party damages, reduce loss time injuries, reduce the need for a 2 man team, reduce travel for 2 man team, reduce customer complaints and reduction in resource for cable damage investigation.
In addition to this there is the non-quantifiable benefits of having a more confident and reassured workforce to conduct work on sites when these problem pipes arise.

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.

The estimated cost of the cool is £4,000 per unit.

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

All GDNs undertake a vast range of work types which involve identifying underground assets within their network. The GDNS rely on utility plans, street furniture and a cat & genny before works. There are times where a pipe has been located safety and excavated around, however the identification of that pipe is often difficult. This project is looking at a safer and more accurate way of identity unknown pipes. As a result, the learnings from this project can be directly applied to each network.

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

Safety & Emergency
☑ 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.

Several checks have been undertaken to ensure no current solution exists to address the outlined challenge. Assurances from the EIC on their market analysis have informed us that no other tool exists capable of doing what this project aims to develop.

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

Due to the upward trending curve of electrical cables being inserted in old abandoned gas steel pipes, engineers onsite have means of knowing whether an electrical cable, or other unknown elements are present in the gas pipe they are operating on, and more importantly if a cable is present, if it is energized or not. There is currently no existing solution to enable detection of unknown buried assets without drilling the pipe which brings added risk to engineers.

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 level of uncertainty within the project, if it is possible to detect with 100% accuracy the elements within an unknown asset is a risk greater than the networks 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

This project is novel not only in the development of the Live & Dead tool, but also to enable its route to commercialization and business as usual. As such, it faces uncertainty on two fronts; The level of risk within the outlined areas of current processes and change is beyond the current appetite of the network; therefore achievement in accuracy to satisfy Health and Safety and commercial viability are the areas of uncertainty we are looking to address within the project.

This project has been approved by a senior member of staff

☑ Yes