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 2016

Project Reference Number

NIA_NGN_186

Project Registration

Project Title

Highly Portable GPR

Project Reference Number

NIA_NGN_186

Project Licensee(s)

Northern Gas Networks

Project Start

October 2016

Project Duration

1 year and 1 month

Nominated Project Contact(s)

Mark Simpson

Project Budget

£79,990.00

Summary

It is anticipated to conduct the project in three stages of multiple work packages, separated by Stage Gates. A three stage process is proposed taking the GPR sensor, in conjunction with Sterling GEO's partner organization.

Initial focus will be to fully scope out the problem leading to a specification against which any developed solution can be appraised and the refinement of the existing sensor to match this specification. It will then be trialed to prove that the results are comparable to existing methods.

Later stages will focus on increasing the application methods and increasing the usability/ease of interpretation of the developed system/GPR results.

Third Party Collaborators

Sterling GEO Limited

Energy Innovation Centre

Nominated Contact Email Address(es)

innovation@northerngas.co.uk

Problem Being Solved

Current asset detection and identification methods include Ground Penetrating Radar (GPR) which is used to locate buried assets within the utility distribution networks and construction industry. These devices however are often trolley mounted, weighing over 20kg, displaying raw GPR data on a separate screen. Interpretation is therefore undertaken by a skilled operator leading to surveys being facilitated by specialist third party companies. Also due to the cumbersome size of the unit it can render many deployments inaccessible, especially in rural areas and across difficult terrain.

There is therefore a reduction in use due to difficulties in GPR deployment and interpretation of data. A lightweight GPR unit either handheld or UAV mounted will significantly increase the assets that can be inspected and the quality of output achieved. The need for a skilled operative on the ground will be progressively reduced as the data can be gathered and sent remotely to the office based expert for immediate interpretation both reducing costs and speeding up the process of delivery. Over time Deep Learning algorithms will reduce this need further.

Method(s)

It is proposed to further develop an innovative Ground Penetrating Radar unit;

- Small size - on board backup data store, weight - 850g, size - 250x250x180mm
- WIFI - the unique real time Wi-Fi capability could facilitate immediate processing, validation and analysis of data allowing immediate refinement of the collection process and avoid delays and potential costly revisits
- GPS – integration of accurate Real Time Kinematic (RTK) based GPS to allow asset positioning
- Data – development of data structures to allow importing of data into current 3D GEO modelling software
- Database – begin development of a foundation empirical database of features
- Graphical display - development to produce easily decipherable 2D or 3D graphical outputs
- Adaptable - adapt sensor unit for highly portable deployment including hand held, trolley mounted and unmanned aerial vehicle (UAV)
- Automatic interpretation – begin development of algorithms to interpret and identify buried assets including change comparison against existing records

This system will allow increased deployment of GPR via a broader range of methods across the distribution networks. In time it will allow the network operator to quickly, accurately and easily; locate buried utility assets; detect voids; determine depth of cover; determine reinstatement thickness/cavities/condition; survey proposed pipeline route for archaeological/historical interest; reducing the need fora site based GPR expert with minimal environmental impact and in difficult to access locations. Concrete utility structures may also be possible to survey without the requirement to work at height.

Scope

It is anticipated to conduct the project in three stages of multiple work packages , separated by Stage Gates . A three stage process is proposed taking the GPR sensor, in conjunction with Sterling GEO’s partner organization.

Initial focus will be to fully scope out the problem leading to a specification against which any developed solution can be appraised and the refinement of the existing sensor to match this specification. It will then be trialed to prove that the results are comparable to existing methods.

Later stages will focus on increasing the application methods and increasing the usability/ease of interpretation of the developed system/GPR results.

Objective(s)

- To scope requirements for system
- To further develop sensor to detect utility assets
- To develop prototype handheld unit to allow deployment of sensor
- To develop GPR display and GIS output to allow comparative data to be gathered
- To carry out field trials of prototype handheld unit to gather data
- To compare results of handheld unit to existing GPR results

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

1. Data output proven against existing GPR data and through comparison tests
2. Accurate GPS positioning achieved
3. Successful field tests with varying conditions and locations
4. Established accurate and reliable database
5. Data proven by exposure e.g. undertake trial holes to prove location and depths located by the GPR

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

This project has the potential to change the way that we carry out underground asset detection, if successful it could enable GDN's to become self-sufficient and not reliant on third party resources.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

The Project will be predominantly a design and development exercise in the early stages which will be undertaken by the supplier at their premises.

As part of the later stage the network will identify locations on the network in which to trial the prototypes.

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

NGN External expenditure - £ 60,000

NGN Max Internal expenditure - £19,920

Total NGN expenditure - £79,990

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)

An approximate spend of c. £100,000 per annum is spent using specialist GPR services within Northern Gas Networks. This relates to planned work activities where complex underground infrastructure is present. The availability of an in house system will reduce the requirement for specialist services by approximately 50%, as some sites will still require a specialist skill set.

The utilization of the newly developed smart system will enable network staff to undertake surveys in-house more efficiently and allow increased deployment of GPR via a broader range of methods across the distribution networks.

Please provide a calculation of the expected benefits the Solution

Approximate annual spend per annum (current) - £100,000

Forecasted annual spend per annum (post-project) - £50,000

Forecasted benefit per annum - £50,000

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

The utilization can be replicated across all GDN's, a newly developed smart system will enable network staff to undertake surveys in-house more efficiently and allow increased deployment of GPR via a broader range of methods across the distribution networks.

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

The cost for implementation is dependent on the strategy of each GDN. The project is aiming to produce a portable GPR unit that is not required to be operated by a user with special skills. The targeted unit cost for the portable GPR unit is in the region of £18,000. The anticipated strategy, dependent on project outputs, for NGN are that 2 units are implemented post completion. At a network investment of £36,000, for this to be implemented by all 8 GDN's the implementation cost would be £288,000.

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 report from the project will be readily available on the smarter network portal once the project is complete. The project's main aim is to develop a prototype GPR device which can be used in the field, if this proves successful then each GDN will have the ability to carry out their own underground asset detection.

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.

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