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

Sep 2013

Project Reference Number

NIA_NGN_042

Project Registration

Project Title

Visual & Acoustic Leakage Detection

Project Reference Number

NIA_NGN_042

Project Licensee(s)

Northern Gas Networks

Project Start

June 2013

Project Duration

0 years and 4 months

Nominated Project Contact(s)

Graeme Cleeton, Dean Woolley, Ian Whitehead, & Alec Breen

Project Budget

£141,250.00

Summary

Detecting leakage were no immediate obvious solution is available, typically city centre locations, congested highways or locations with particular specific engineering difficulty, repairs can be expensive to undertake requiring significant resources, disruption to customers and can take a long time to resolve. Leakage detection is currently undertaken by using a Wheatstone Bridge based detector to pinpoint the closest location of the escaping gas from the surface. While in the majority of cases this technique can quickly provide good guidance to engineering teams on the exact excavation location point to undertake the repair.

In situations of engineering difficulty these indications can be some distance from the mains escape point, leading to “dry” holes, extended excavations or trial holes to assist in locating the actual leakage point.

Third Party Collaborators

JD7

Balfour Beatty Utility Solutions

Nominated Contact Email Address(es)

innovation@northerngas.co.uk

Problem Being Solved

Detecting leakage were no immediate obvious solution is available, typically city centre locations, congested highways or locations with particular specific engineering difficulty, repairs can be expensive to undertake requiring significant resources, disruption to customers and can take a long time to resolve. Leakage detection is currently undertaken by using a Wheatstone Bridge based detector to pinpoint the closest location of the escaping gas from the surface. While in the majority of cases this technique can quickly

provide good guidance to engineering teams on the exact excavation location point to undertake the repair.

In situations of engineering difficulty these indications can be some distance from the mains escape point, leading to “dry” holes, extended excavations or trial holes to assist in locating the actual leakage point.

Method(s)

To insert from a remote location an interchangeable hi-resolution CCTV, together with a hydrophone leakage detection indicator in the gas mains system. To undertake real time analysis of a significant length of gas main internally to pick up audibly gas leaking from the network.

Insert a ruggedized CCTV system with an on-board hydrophone with the adjustable sensitivity to pick up gas escaping from the network. The system includes a pressurised launch and feed system which allows safe and consistent feeding of the system during live insertion work. There are no products currently available within the gas industry that uses multi sensor technology with the robustness and quality required.

The hydrophone and software is sensitive enough to detect the smallest of leaks within low pressure gas distribution systems. Full leakage acoustic signatures can be displayed graphically or using the conventional audio output as headphones and HD CCTV live images allow the operator to validate the full survey.

A sound recording will be made prior to repair excavation and will maintain recording during repair process. This will develop new learning of typical sound profile for different leakage levels and types.

Scope

Difficult to address escapes are constantly monitored by competent gas engineers to ensure safety of the public to ensure no increase in risk occurs. This allows for planning and detailed further investigations to take place. These long duration jobs are recorded and monitored on NGN’s “Escape Log” West Yorkshire currently has 70 “long duration” jobs on the log (1.6.13) this will form the priority workload that this system will address.

It will initially focus on the Low Pressure, large diameter escapes in difficult highly urbanised locations.

NGN together with JD7 & BBUSL have undertake a short, no cost demonstration trial on this equipment which provide sufficient evidence that this technique, used in the water industry can be transferred to the Gas Sector. The trial demonstrated the potential to reduce leakage repair times, reduce dry excavations and provide greater guidance on repair actions.

The aim of the project is to:

- Assess if Acoustic monitoring improves leakage detection accuracy and pinpoint actual escape points accurately
- Assess the accuracy of the Hydrophone to locate leakage
- Assess the level of leakage detected at the required sensitivity
- Assess the actions required why no leakage detected by the hydrophone
- Assess the procedural changes needed to NGN suite of escape management procedures to implement this system
- Assess process changes within NGN to ensure acoustic monitoring can be deployed effectively to reduce the time to complete difficult escape jobs
- Develop a full business case for the deployment across the whole of NGN and other Gas Networks.

Objective(s)

To objective of the assessment to reduce the number of long duration escape jobs on the West Yorkshire escape log from 70 to 40 over a 12 week period.

To establish a full cost benefit analysis on the use of this technique. To establish the safety procedures required for deploying this technique and what controls are required to ensure increased safety is maintained To assess the skills and training required to deploy this equipment, with recommendations for full deployment

- Reduction in reinstatement requirement

- Measure the impact on NRSWA
- Measure the impact on Customer – especially around traffic disruption.

Produce a detailed summary report for each job detailing findings, results and outcomes.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

- To reduce the cost of a long duration repair by over 33%
- To reduce the number of long duration jobs on the escape log by 57%
- To complete a minimum of 100 jobs within a 12 week period capturing empirical evidence of results
- To produce a final report within 5 weeks of the project completion detailing summary of the project, recommended changes to procedures, deployment changes required and draft business case for roll out.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The aim of the project is to undertake a minimum of 100 jobs across a range of engineering difficult locations. It is necessary to undertake a minimum of 100 jobs to ensure a broad sample is undertake to obtain a statistically robust database of records. It will allow the data produced by the trial to be tested robustly for a level of accuracy and ensure the system increases the level of safety.

If the work was undertaken on a more limited sample or over a shorter duration new leakage report jobs may be missed and the variety of location would be limited. This could result in further trials be needed to ensure all aspects are covered.

Technology Readiness at Start

TRL6 Large Scale

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

Initially the project will focus on West Yorkshire as it has the high proportion of engineering difficult jobs outstanding. However, every opportunity will be taken, where appropriate to extended to trial to East Riding especially where it will extend the scale of the project. NGN may also look across the network for any highly unusual escapes that could benefit from being included into this trial.

Revenue Allowed for the RIIO Settlement

Unavailable

Indicative Total NIA Project Expenditure

£111,250 External

£30,000 Internal

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)

It is estimated that this could reduce repair costs by over 33% - cost of typical difficult repair £2,500 could save £825.00 per job.

Please provide a calculation of the expected benefits the Solution

The project will continue to monitor and track Base Cost vs Actual Cost this is the assessment from the proof of concept trial.

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

This can be wholly replicated by every Gas Network that encounter large diameter low pressure escapes in highly urbanised areas.

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

NGN believe that this one of these units would be deployed in each Region (3 Regions) at a cost of £580,000 per year savings estimated:

FCO not visiting completed jobs reduced by 7 days per completed job, £20 / Visit / 50 jobs per month = £84,000

Reduction in repair costs savings over base costs £2500 * 33% = £825.00 * 50jobs per month = £495,000

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):

- [x] 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)
- [x] 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

This is a unique piece of equipment never before deployed on a gas network. The learning will be about the ability and sensitivity of this equipment to accurately detect small low pressure gas escapes by the use of listening equipment. The learning will be around sensitivity, escape rates, background noise levels and changes to operational practices.

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

Part of NGN's Total Network Management approach to take a more holistic approach to maintenance of the network. This could provide a robust tool to deploy earlier in the reported escape process to allow repair planning to take place earlier and work completed sooner. It also fits with our environmental approach of minimizing excavation and reinstatement together within developing new leakages strategies. A more measured targeted approach will increase productivity.

☑ 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

- [x] Yes