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

Jan 2014

Project Reference Number

NIA_NGN_45

Project Registration

Project Title

Remote Water Removal System

Project Reference Number

NIA_NGN_45

Project Licensee(s)

Northern Gas Networks

Project Start

October 2014

Project Duration

1 year and 4 months

Nominated Project Contact(s)

Nick Phillips, Gordon Thompson, Alec Breen and Wez Little

Project Budget

£290,000.00

Summary

The scope of this project is to carry out a technical feasibility study to investigate technical potential to develop a single operation water removal system from a remote location along gas mains ranging from 3” to 12” diameter in the metallic network and from 75mm to 250mm in the PE system.

Third Party Collaborators

Synthotech Limited

Nominated Contact Email Address(es)

innovation@northerngas.co.uk

Problem Being Solved

Water entering the gas network creates significant network management issues primarily around the location of entry points, removal from the network and methods of removing its cause. Gas enters the aging cast iron low pressure system from a variety of sources as the pressure of the water exceeds the pressure inside the gas network.

Detecting water ingress into pipes is extremely difficult as it prevents gas escaping our normal detection techniques cannot pinpoint the exact entry point. Water within the system creates blockages as it either fills the main system or entry smaller services this disrupts supplies to customers either individual services or multiple consumers. Internal pipe diameters can also be reduced when water enters the system causing poor pressure issues, without the network truly understanding its cause this leads to raised pressures on the low pressure to maintain supplies, this has the effect of increasing public reported escapes and increased leakage.

Water entering the gas network also becomes contaminated as it travels through the aging metallic system when operators locate water and remove it from the network its disposal is an environmental issue and costly to NGN. The current method also involves

releasing gas to atmosphere until the whole of the water is removed.

Method(s)

Synthotech Limited, an innovative engineering company with a proven history of design, development, manufacture and supply services has developed a prototype system used by an overseas customer, on higher pressure networks, and never deployed in the UK before as system that could remove water in a single operation from a remote location.

This technical project explores the feasibility of developing this system so that it can that it can operate on a live low pressure (below 75mbar) network with the aim of locating the point of the blockage or restriction, removing the water and then locating the point of entry in a single no gas operation.

It is envisaged that the CCTV Water Extraction System will comprise of a HD camera system, an umbilical push rod method, with a suction device embedded into the front of the system. The suction device is designed to extracts the water through the umbilical push rod system. Rather than utilising the pipeline pressure to extract the water and flare the gas, the project will focused on all environmental aspects and use a novel differential pressure system to separate the water from the gas, and recycle the gas back into the network, preventing any greenhouse gas emissions.

Initially this project will cover two key stages:

Project Scope & Design: The development of such a system requires the development of:

- A detailed project specification A detailed project specification
- Consider relevant Stakeholders
- Impact assessment on policies and procedures
- Current data and processes
- Design specification for field trial stage

?Feasibility Study: Will also look into the individual system components, including a review of all other globally available technology to enhance the key aims of the methodology. The key areas are:

- Access to the network, including selection of entry points
- Network Entry, no gas entry methodology
- Use on Metallic Mains on size range 3” to 12”
- Use on PE Pipelines on size range 75mm to 250mm
- Operating Network Pressure System initially limited to below 74mm
- Test volumes of extracted water
- Trial optimum distances from remote location h. Water disposal methodology
- Recycling and reinjection of gas back into network

In-pipe CCTV operation To ensure that this project meets the success criteria a project team will be set up to oversee the project to ensure it achieves its design objectives. This will include a project sponsor, lead technical manager and regular senior management reporting processes. Consideration will also be made during the scoping stage on the requirement to engage with a professional external project manager, with specific programme management skills.

Scope

The scope of this project is to carry out a technical feasibility study to investigate technical potential to develop a single operation water removal system from a remote location along gas mains ranging from 3” to 12” diameter in the metallic network and from 75mm to 250mm in the PE system.

Macaw Engineering Scope

It is proposed that the scope of work will be split into 4 discrete Tasks:

Task 1 – Review of Historical Water Ingress

Task 2 – Investigation of Likely Water Ingress Locations

Task 3 – Water Transport Modelling

Task 4 – Techniques for Monitoring Water Ingress

All tasks will be discussed in detail within a final technical report.

Objective(s)

The objectives of this feasibility study are to:

- Develop appropriate technology that will easily, simply and quickly remove water from a remote location
- Entry to either metallic or PE main via a small single entry point under no gas operation
- A single operation to locate, remove and identify entry location of water from up to 100mtrs from entry point on pressures up to 75mbar
- Develop a methodology of recycling gas back into the network and separating water from contaminated water
- Develop planning tools and assessment criteria to change processes for dealing with water ingress
- Develop and produce specifications and management procedures
- Produce documents, reports, presentations and seminars to share the learning from this project

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Stage One:

- Deliver a detailed report on the root causes, behaviours and possible solutions around water ingress
- Assessment of costs of existing method and potential new technological solution

Stage Two The detailed success criteria will be determined largely by stage one however the expected outcomes are likely to be:

- A detailed report on the current methodology and approach to water extraction and hope this alternative approached aimed to resolved current issues.
- An assessment of current cost of extraction verse an alternative method
- Additional benefits of the use of a combined system and recommendation for future uses or development opportunities
- Detailed technical assessment and guidelines for the introduction or changes to existing policies, procedures and processes

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

NGN believe that learning can be obtained using a small scale project focusing on developing the prototype into a working system into a fully developing work model. We intend to focus on the system used overseas initially and existing camera technology. Throughout the project these will be evaluated and challenged for appropriateness.

Water entry into the low pressure system creates the most impact on customers and pressures at the higher tiers often restrict water entry. By focusing on route cause and effect on the low pressure systems any higher tier issues will feed into the reports and inform this project for as part of future developments.

By focusing on the smaller diameter range up to 12” we believe that this will cure the vast majority of water ingress, not created by damage. Water entry into larger diameter pipes creates less network management issues due to their capacity to absorb its impact.

It is planned to undertake 50 jobs under the development stage. This is required to capture and complete work on the full range of metallic and plastic pipe sizes.

Technology Readiness at Start

Technology Readiness at End

TRL5 Pilot Scale	TRL8 Active Commissioning

Geographical Area

This project will initially focus on the Northern Region with NGN but will expand as opportunities arise and skills are developed. NGN believe this to be a small scale feasibility and development project best suited to a single network undertaking a small scale trial and sharing the learning in the most appropriate manner.

Revenue Allowed for the RIIO Settlement

During RIIO-GD1 NGN will spend approximately £85.8m on Emergency and £139.1m repairs on all mains and services. As this project is a feasibility study and development for a technology, at a currently low level TRL, it is not yet possible to determine the impact on this spend forecast. However, we believe that developing this type of equipment and this completely new approach it will assist NGN to maintain its frontier position and reduce costs across the sector, if progressed successfully.

Expected savings against specific areas will be quantified in within stage one and finally actual assessments will be delivered as part of the final report.

Indicative Total NIA Project Expenditure

Initially this project will require £121,000 external funding from the NIA Allowance with around £17,500 internal resource expenditure. As the process is significantly technical and impacts on the network internal specialist skills will be required to support the project. However, where costs are part of BAU or reduce existing expenditure these will not be entered as part of these costs.

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)

As stage one of this project is solely a feasibility study of the cause/effect and issues around the technology, it is difficult to quantify the potential financial benefits at this stage. However, it is envisaged that deployment of the technological solution would lead to financial benefits in the following areas:

- Reduce customer disruption to supply cause by water ingress and associated costs; including excavation and reinstatement.
- Risk reduction and risk management demonstration.
- Leakage reduction within the national leakage model.
- Avoided condition replacement.

Please provide a calculation of the expected benefits the Solution

N/A As stage 1 is a research project. Stage 2 base costs vs method cost will be added on completion of stage 1

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

As Stage 1 is the research and feasibility element no exact data is available on cause and effect. The capturing of water ingress incidents within our job recording system is not clearly defined but will be reported at the end of stage 1 to form the basis of a cost assessment. Stage 1 will provide a dashboard report that will provide Management Information on the level of incidents within NGN. This will be extrapolated across GB.

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

These costs will be included in stage 2

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 network licensees encounter water within the low pressure system and will be able to use the learning generated from this project as the outcomes will be presented in a clearly defined report published on our website.

The learning will be generated by fully exploring the cause and effect of water ingress, developing strategies for planning quick resolution of these issues and adopting a technological solution that can, from a single remote excavation locate and remote unwanted water from the 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)

Within our innovation strategy we highlighted a number of challenges that this project addresses: Include: new plant location equipment, technologies that help assist pinpointing escapes and maximise the use of non-intrusive repairs. It also form part of the innovative Total Network Management approach adopted by NGN, addressing pressure, leakage and escapes as an integrated approach by planning the right resources in the right place at the right time with the right technology to complete the work with minimum disruption to customers.

☑ 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