

## NIA Project Registration and PEA Document

### Date of Submission

Nov 2016

### Project Reference Number

NIA\_NGN\_168

## Project Registration

### Project Title

Water Ingress Investigation

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NIA\_NGN\_168

### Project Licensee(s)

Northern Gas Networks

### Project Start

November 2016

### Project Duration

1 year and 0 months

### Nominated Project Contact(s)

Steve Pigott spigott@northerngas.co.uk

### Project Budget

£155,000.00

## Summary

The scope of work for this stage is split into four main tasks:

1. Develop a modelling tool for calculating volumes of water
2. Identify likely Locations of Water Ingress/Collection
3. Use of portable dew point moisture testing in conjunction with Network Analysis
4. Online Monitoring and reporting of water level and moisture content

## Third Party Collaborators

MACAW Engineering Limited

## Nominated Contact Email Address(es)

innovation@northerngas.co.uk

## Problem Being Solved

Northern Gas Networks (NGN) own and maintain more than 37,000 km of gas pipes and nearly 36,000 km of these operate at pressures below 7 bar. Each year NGN experiences a significant number of events of water ingress into low pressure gas distribution pipes. When water enters a gas network, a risk to consumers arises from water forming seals in undulating pipes; this often results in reports of poor pressure and interruptions to gas supply. Ingress into the network can occur through pipe joints and due to "third party" damage.

In many cases, the location at which water naturally collects can be some distance from the point of water ingress. The movement of water through a gas distribution pipeline will be determined by several factors, including local pipe geometry and topography. This can make the precise location of water ingress extremely difficult and costly.

## Method(s)

Stage 1 of this project [1] looked at the incidence and causes of water ingress. This included the feasibility of using Geographic Information System (GIS) analysis, combining multiple data sources, to help identify the likely points of ingress, and water transport modelling to understand the movement of water through the gas network and to identify potential collection points.

The objectives of Stage 2 are to further develop the work by taking the learnings from desktop studies in Stage 1 and to conduct field trials to demonstrate that they can be implemented. Other recommendations from Stage 1 and subsequent work on water ingress by NGN will be incorporated into new lines of investigation.

## Scope

The scope of work for this stage is split into four main tasks:

1. Develop a modelling tool for calculating volumes of water
2. Identify likely Locations of Water Ingress/Collection
3. Use of portable dew point moisture testing in conjunction with Network Analysis
4. Online Monitoring and reporting of water level and moisture content

## Objective(s)

The objectives of this project are to further develop the work by taking the learnings from desktop studies in previous work undertaken by NGN and Rosen and to conduct field trials to demonstrate that they can be implemented.

## Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

## Success Criteria

### 1. Modelling Tool for Calculating Volumes of Water

- Workshop/meeting with Network Analysis and MRP teams to establish requirements for a modelling tool and collect information regarding data availability
- Based on the established requirements, develop a modelling tool that can be deployed on the ESRI ArcGIS platform and used by NGN staff
- Demonstrate the modelling tool through a number of scenarios that, as far as possible, simulate previous water ingress events.

### 2. Likely Locations of Water Ingress/Collection

A series of GIS layers covering the entire NGN below 7 bar network. Data layers produced will be Compatible with ESRI ArcGIS and will show likely ingress locations and network low points.

### 3. Portable dew point moisture testing

Suitable instruments will be identified and, working with Network Analysis, will be subjected to field trial.

### 4. Feasibility Study into Online Monitoring of Water Ingress

- Assess the requirements for use and performance of hygrometers. Determine the feasibility of installation of moisture monitoring at above ground meter boxes, upstream of the meter.

- A technology search of available level indicators, hygrometers and associated equipment.
- Design, assemble and test a prototype set of equipment in the laboratory before being deployed in the field by NGN (under G23).
- Establish requirements for integrating data from moisture content measurements into existing NGN corporate data capture and reporting systems.

## Project Partners and External Funding

This project is completely funded by NIA finance.

Northern Gas Networks

MACAW Engineering Limited

## Potential for New Learning

Currently we respond to reports from the public when water gets in our network due to low pressures or loss of supply, with this project we will potentially be able to monitor water ingress remotely, allowing us to be proactive rather than reactive.

## Scale of Project

This project plans to develop a prototype response system and piece of equipment which will take place in field trials under NGN's G23 process.

## Technology Readiness at Start

TRL4 Bench Scale Research

## Technology Readiness at End

TRL8 Active Commissioning

## Geographical Area

The project will be held at both NGN and MACAW premises, with field trials being carried out in selected areas within the network.

## Revenue Allowed for the RIIO Settlement

N/A

## Indicative Total NIA Project Expenditure

NGN External expenditure - £116,250

NGN Internal expenditure - £38,750

Total NGN expenditure - £155,000

## 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 outputs will introduce an improved process to investigate water ingress via water vapour transportation. The outputs will also provide the potential for early warning of potential loss of supply on the network. This will lead to a reduction in the number of water related customer interruptions and associated complaints

#### Please provide a calculation of the expected benefits the Solution

Current costs per annum relating to 2500 interruptions with a forecasted 50% reduction in customer interruptions and associated complaints would reduce the annual cost and deliver £141,038 of benefit.

|                                | Current         | 50% improvement |                 |
|--------------------------------|-----------------|-----------------|-----------------|
| Interruptions                  | 2500            | 1250            |                 |
| Resource cost per interruption | £107            | £107            |                 |
| Resource cost                  | £267,675        | £133,838        |                 |
| Complaints received            | 32              | 16              |                 |
| Network complaint cost         | £14,400         | £7,200          | <b>Benefit</b>  |
| <b>Total Cost</b>              | <b>£282,075</b> | <b>£141,038</b> | <b>£141,038</b> |

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

As above x 8 GDN's (subject to workload and complaint volumes)

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

The costs to implement the method across all GDN's would be subjective based on the number of hygrometers installed, however the costs for the desk top based exercises can be calculated as below at a cost of c.£70,000 per GDN (without development of physical equipment cost attributed).

£70,000 x 8 GDN's = £560,000

### 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**

All GDN's suffer with water ingress within our pipes, this project aims to develop a prototype piece of equipment which all GDN's will be able to purchase and install within their 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)**

The project aims to deliver a prototype equipment which can be used to monitor water ingress. This has the potential to reduce customers off gas, therefore reducing customer complaints and improving efficiencies with the way we work.

It addresses NGN's strategy focus areas of Asset & Network Management and Customer service.

- ☒ 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.**

There is currently no device that is capable of monitoring water ingress remotely and no other project has been registered on the SNP

which matches this project.

**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