

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\_WWU\_003

## **Project Registration**

### **Project Title**

Iron Mains Condition Assessment System

### **Project Reference Number**

NIA\_WWU\_003

### **Project Licensee(s)**

Wales & West Utilities

### **Project Start**

April 2012

### **Project Duration**

1 year and 4 months

### **Nominated Project Contact(s)**

Ian Marshall and Lucy Mason (WWU)

### **Project Budget**

£492,309.00

## **Summary**

The scope of this phase is to develop the tool from the proof of concept tool of Phase 1 incorporating the following deliverables:

1. Increased number of sensors for greater pipe wall coverage and survey detail
2. Increased maximum survey length
3. Increased survey speed
4. Improved data capture, analysis and management software

### **Nominated Contact Email Address(es)**

innovation@wwutilities.co.uk

## **Problem Being Solved**

To determine the condition of tier 2 and 3 iron mains that are no longer replaced as a matter of course with the implementation of the Iron Mains Risk Reduction Programme. Knowledge of the asset condition, as determined from both the level of corrosion (loss in wall thickness) and strain in the pipe wall, will allow GDNs to:

- Accurately determine the risk these main pose to the public and network,
- predict remaining life of the asset to a level of accuracy not previously possible
- allow for targeted, informed and innovative interventions to be undertaken in the most cost efficient manner

## Method(s)

This stage will develop on the technology demonstrated in the proof of concept tool developed for Phase 1 into a full scale prototype. This is intended to demonstrate the ability of the technology to be used for extended surveys whilst also producing more detailed results, as would be required for cost effective implementation of the tool on a network.

## Scope

The scope of this phase is to develop the tool from the proof of concept tool of Phase incorporating the following deliverables:

1. Increased number of sensors for greater pipe wall coverage and survey detail
2. Increased maximum survey length
3. Increased survey speed
4. Improved data capture, analysis and management software

## Objective(s)

The project objective is to develop, build and test a condition assessment tool to be used within cast iron mains. This tool will detect both internal and external defects in the pipe wall as well as the actual strain in the pipe wall continuously along the surveyed length. This phase develops on the demonstrated in the proof of concept, Phase 1, into a 'full scale' working prototype prior to further development for live entry into the network.

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

n/a

## Success Criteria

Successful demonstration of the defect and strain detection sensors and analysis through the completion of an extended survey of ≈200 m of abandoned 12" cast iron main.

## Project Partners and External Funding

Wales and West Utilities

National Grid Gas Distribution

DVS Technology

## Potential for New Learning

The main output for this project will be a condition assessment tool that is able to accurately detect both defects (on the inside and outside walls of pipes) as well as the strain in the pipe wall. This is being done through the development and novel adaption of an existing technology.

It is expected that the knowledge of actual condition of iron mains, determined through a combination of corrosion / wall thickness loss as well as the forcing function acting on a pipe (interpreted through measurement of the inherent strain), would revolutionise the way in which these assets are managed; allowing for accurate determination of the risk of these mains failing and thus the risk posed to the network or general public as well as the expected remaining life of these assets. It is also expected that this knowledge of the condition will allow for targeted, informed and innovative interventions optimising asset life and providing for the most cost effective interventions.

## Scale of Project

Phase 1 of the project provided a proof of concept of the technology, developing the technology from a desktop demonstration into a basic prototype; tested and proved in 80 m of abandoned 10" spun iron main.

Phase 2 develops this basic prototype into a full scale working prototype for further validation in longer lengths of abandoned iron

mains.

Phase 3 would provide further validation and development of the tool and the entry system for live entry into the network.

Another stage running in parallel is required to develop understanding of the surveyed condition and the expected remaining life as a result as well as developing a code of practice for the tools use.

Phase 4 would involve the roll out and use of the technology throughout the network.

### Technology Readiness at Start

TRL2 Invention and Research

### Technology Readiness at End

TRL5 Pilot Scale

### Geographical Area

UK mainland

### Revenue Allowed for the RIIO Settlement

The move from the Iron Mains Replacement Programme (IMRP) to the Iron Mains Risk Reduction Programme (IMRRP) will result in significant volumes of tier 2 and 3 iron mains, that would have been replaced, will now remain in service. Without intervention it can be expected that over time these mains will continue to deteriorate and fail with increasing regularity and potentially catastrophic consequences.

The knowledge of the actual condition of these mains will allow GDNs to confidently predict the likelihood of failure. As a result GDNs will then be able to operate with a confidence and in a cost effective manner not previously possible, whilst continuing to ensure the safety of the public and uninterrupted supplies; those mains in good condition can be operated as normal without intervention, or targeted, innovative interventions can be utilised to extend the asset life, similarly those mains that need to be replaced can be at the optimal point in their asset life. Expected savings beyond the safety and security of supply benefits could only be quantified once the condition of the asset is known and intervention options identified.

### Indicative Total NIA Project Expenditure

#### WWU

£150,000 IFI expenditure

£75,000 NIA expenditure

£225,000 Total expenditure

#### NGG

£167,559 IFI expenditure

£99,750 NIA expenditure

£267,309 Total expenditure

## 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 project outputs will be centered around reliability and safety by proving the condition of larger diameter (tier 2 and 3) iron mains; this will allow for all further interventions on these assets to be informed and conducted at the most cost efficient point in the assets life cycle and in the most cost efficient manner; potentially providing justification for extending an assets life.

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

Not required for Research project

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

This method and the tool developed could be applied across the whole of GB, it is principally focused on tier 2 iron mains however it is expected that further development for tier 3 iron mains will occur and similar solutions may be subsequently developed for and implemented on tier 1 iron mains should a requirement for this be identified.

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

The knowledge generated as part of this project will be disseminated to the other networks as a matter of course. The costs incurred would be a product of the purchase of the tool and materials (yet to be determined).

### 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 learning generated will be in the form of a new tool for the condition assessment of cast iron mains. The results of this learning will be made available to all network licensees and the tool will be available for all networks to implement.

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

Not applicable – learning can be applied by all Network Licensees therefore please refer to i) above.

- 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.

The tool under development utilises a unique adaptation of an existing technology. A review of the existing non-destructive evaluation technologies currently available on the market (including some live trials) failed to identify any technologies that could match the outputs and potential of the cutting edge technology under development.

All GDNs have been made aware of the project (through documentation and meetings) and those not collaborating were invited to collaborate on the project following the completion of Phase 1.

Since starting this project it has come to our attention that another GDN has recently submitted a NIC project for consideration, that may in part duplicate the objectives and outputs of this project, specifically: “3. A robotic visual and non-visual inspection module including sensors for collection of corrosion, cracking, wall thickness, stress and pipe condition data”. The ISP of the NIC submission indicates that the technology for this has yet to be identified.

### 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