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

Feb 2014

Project Reference Number

NIA_SGN0023

Project Registration

Project Title

Cured In-Place Pipe (CIPP) (Stage 2)

Project Reference Number

NIA_SGN0023

Project Licensee(s)

SGN

Project Start

August 2013

Project Duration

2 years and 8 months

Nominated Project Contact(s)

SGN - Oliver Machan (Innovations Project Manager) SGN - Andy Musgrave (Project Manager) NGG - John Reader (Project Manager) NGG - Darren White (Innovation Portfolio Manager) NGN – Ian Foster (Project)

Project Budget

£1,730,796.00

Summary

The scope of this project is to demonstrate 'fitness for purpose' of CIP lining technologies, focusing on iron mains of 8" diameter and above operating up to 2 bar pressure.

Stage 2 of this project directly follows the successful completion of Stage 1, which has developed the Performance Specifications and Best Practice Guide for CIP applications. This aspect of the project will look to review available pipe liner/lining technologies in both the gas and water sectors, and to develop performance specifications and proposed best practice suitable for UK gas distribution deployment aligned to the prevailing commercial and safety regulatory regimes.

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

In January 2012 the gas distribution networks (GDN) jointly initiated a project to explore the potential use of cured-in-place (CIP) liners and polyurethane spray linings as a method of permanent rehabilitation of ageing iron distribution mains.

The CIP technique is a method whereby a host pipe is lined with a flexible tube which is impregnated with a thermosetting resin, which produces a tough pipe lining after resin cure. The resin may be cured using various techniques including steam, hot water and UV light. The technique was developed in the mid 1970's and is now used extensively throughout the world, with at least 30,000 kilometres installed to date. A range of technical solutions are being considered including non-structural, semi-structural and fully structural, the last of which might be deemed a permanent replacement solution where it does not rely on the host pipe.

Early indication from this project (Stage 1), based on International experience and standards, and indeed limited legacy deployments

on the GB network, has given a level of confidence that the technology can meet, or can be developed to meet, specifications and installation standards for the GB gas network at acceptable cost. This has been confirmed by suppliers as part of Stage 1. Limited visual examination of UK samples of a Paltem CIP lined 12" steel gas main installed in the early 1980s shows the liner to be in good condition, giving further confidence on the expected service life of such systems.

The aim of Stage 2 is to test and validate against the Stage 1 documents with the goal of establishing the generic approach as 'fit for purpose' as a rehabilitation technique for iron gas mains up to 2bar.

Method(s)

In order to meet the objectives of this stage in the project the following tasks must be successfully delivered:

- Task 1. Project promotion and supplier engagement
- Task 2. Testing of exhumed Paltem CIP liner
- Task 3. CIP liner gap analysis and technology selection
- Task 4. Provision or modification of test rigs
- Task 5. Audit of existing testing results
- Task 6. Manufacture all CIP liner samples
- Task 7. Short-term testing and analysis
- Task 8. Site trials of CIP liner systems
- Task 9. On-going site trial monitoring
- Task 10 Long-term 'accelerated' testing of each system trialled (Part 1)
- Task 11. Long-term 'accelerated' testing of each system trialled (Part 2)
- Task 12. Underground loading trials
- Task 13. Review of CIP performance specification and best practice guide
- Task 14. Risk assessment framework
- Task 15. Develop a 'fit-for-purpose' Certification Scheme
- Task 16. Final review of CIP performance specification and best practice guide

Scope

The scope of this project is to demonstrate 'fitness for purpose' of CIP lining technologies, focusing on iron mains of 8" diameter and above operating up to 2 bar pressure.

Stage 2 of this project directly follows the successful completion of Stage 1, which has developed the Performance Specifications and Best Practice Guide for CIP applications. This aspect of the project will look to review available pipe liner/lining technologies in both the gas and water sectors, and to develop performance specifications and proposed best practice suitable for UK gas distribution deployment aligned to the prevailing commercial and safety regulatory regimes.

The project timeline has been extended to allow the vendor to install and commission a new chemical containment system for the CIPP liner immersion testing following a review of the current facilities. This has had no cost impact on the project.

Objective(s)

The objective of Stage 2 is to test and validate against the Stage 1 documents, under controlled conditions, a range of available CIP lining solutions with the goal of establishing the generic approach as 'fit for purpose' as a rehabilitation technique for iron gas mains up to 2 bar. It is expected that the CIP performance specification and best practice guide will be refined during this stage, and that the tests may identify a development gap for certain technologies ahead of their acceptance. The test programme will embrace the lining materials, the installed liner, and installation practice together with the evaluation of a range of routine maintenance activities (e.g. flow stopping, connections, jointing and repair).

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project will be deemed to be successful if the following criteria are met:

- Production of a contractor certification scheme.
- Successful completion of field trials after 12 months from commencement of the project.
- Production of a revised risk assessment framework.
- Identification of a range of CIP technologies and solutions deemed 'fit-for-purpose' as a remediation approach for iron mains up to 2 bar pressure over a range of diameter classes from 8" to 36".
- A cost benefit analysis of the new technology against current methods.

Project Partners and External Funding

This project has been approved by the Gas Networks Collaboration Forum (GNCF) in March 2013 and is in collaboration with the other GDN's. The project is being led by SGN and is managed by the WRc (Water Research Centre). The GDNs participating in the project are:

National Grid Gas plc

Northern Gas Networks Ltd

Southern Gas Networks plc & Scotland Gas Networks plc

Wales & West Utilities Ltd

Potential for New Learning

The output expectations from the project will include:

- A recommended list of 'fit-for-purpose' CIP liner systems, by application type and diameter class;
- For those CIP liner systems failing to meet the performance specification requirements, a report on known 'development gaps';
- Definition of a 'fit-for-purpose' certification scheme for CIP liner technologies for UK gas mains;
- Stage 2 project report including details of all work undertaken, including: short-term and long-term type testing results for the selected CIP liners, details of laboratory and site trials and a completed generic risk assessment for the CIP liner technique, and;
- Updated CIP liner performance specification and best practice guide embodying findings from Stage 2 testing as required.

GDNs will have access to CIP liner technologies meeting a GB gas sector performance specification and a route to an 'approved' contractors' certification scheme demonstrably conforming to an installation best practice guide.

Scale of Project

The project shall involve collaboration between WRc, SGN and the other Licensees over a 20 month period. During this time each Licensee will carry out field trials covering a wide variety of pipe diameters, types of CIPPs systems (Semi structural and Fully structural), and pressure regimes. This range of trials is required for a sufficiently robust evaluation of the technology to give GDNs the knowledge required to make decisions on its potential applicability in different circumstances.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

WRc will conduct the majority of the testing in their own facilities; however four site trials will be carried out across a number of locations throughout the UK to witness CIP liner installation and observe and report on routine maintenance operations, e.g. re-making connections, tappings, etc. The locations and scale of the field trials are still to be confirmed, once WRc have carried out the Linear Gap Analysis and technology selection, each Licensee will be in a position to select an appropriate site for the trial.

Revenue Allowed for the RIIO Settlement

As this Project is starting at a low TRL, it is not yet possible to determine whether revenue savings are likely during RIIO-GD1.

However it is assumed that if progressed successfully through development and field trial in future stages this type of solution will have potential to provide Network Licensees with a valuable tool with regards to identifying the repair and renewal of ageing metallic mains. Expected savings against specific areas would be quantified in these later stages of development.

Indicative Total NIA Project Expenditure

The total recoverable allowance will be 90% of the project costs shown below for each Licensee under the Network Innovation Allowance (NIA):

SGN

£581,941 NIA Project expenditure

WWU

£133,133 NIA Project expenditure

NGG

£791,500 NIA Project expenditure

NGN

£224, 222 NIA Project 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)

Gas mains replacement is set in a 3-Tier system categorising each size of main dependant on its diameter. Due to the TRL of this project, the cost savings this project will achieve will become clear once the field trials have been conducted across a range of mains diameters and the success and installation costs for each size will be identified.

Some of the areas the system will be applied include Tier 2 mains (>8" diameter, <18") replacement which has a unit cost allowance of £429/m and up to £788/m for the largest mains in London. The CIPP system will be focused on reducing the cost of maintaining and replacing these larger diameter mains providing an opportunity for cost savings – and hence net financial benefits to customers - once the 'best practice' has been identified.

Ofgem has also allowed 1,363 km of Tier2/3 abandonment below the risk threshold based on cost benefit arguments, with an opportunity for the deployment of alternative risk management approaches, i.e. where replacement may not be the only solution. As a result of this project the CIPP system has the potential to form one of the cost effective alternatives to full replacement.

Please provide a calculation of the expected benefits the Solution

This is a research project.

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

This Method could be applied across the whole of GB and potentially could apply to all metallic mains across all Ofgem directed sites with mains size between 8" and 36" with a pressure range up to 2bar.

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

Until the technology has been proven and approved as 'fit for purpose' the cost of rolling out the method across GB cannot be accurately estimated.

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

By undertaking this development work the gas industry as a whole can share the overall cost, knowledge, risk and subsequent benefit from development and testing.

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.

All GB Licensee holders are part of 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