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

Jun 2016

Project Reference Number

NIA_NGGD0070

Project Registration

Project Title

PRISM (Pipe Replacement in situ Manufacturing) - Material Lifetime Testing

Project Reference Number

NIA_NGGD0070

Project Licensee(s)

Cadent

Project Start

May 2016

Project Duration

1 year and 7 months

Nominated Project Contact(s)

NGG PRISM Programme Manager – Brian Tilley

Project Budget

£299,597.00

Summary

As the host pipe could potentially fracture the day after PRISM application or tens of years later, consideration needs to be given to the impact of ageing of the applied resin. The testing will need to consider the saturation and ageing of the resin in a gas main environment and this will be undertaken separately by 3M, the manufacturers of the resin. The focus of the study outlined in this project submission will be to assess the suitability of the applied resin layer for use as a long term stand-alone pipe as more of the PRISM pipe becomes exposed to the surrounding environment following the continuing deterioration of the host pipe.

Further testing will also be undertaken to establish the ability of the applied resin layer to withstand the external loads which could be applied if the external water table is high. The resistance of the resin layer to collapse from external loading is related to the long term stiffness of the resin material and this will also be established separately by 3M through a series of laboratory tests which establish test times for a range of loads which can be extrapolated to provide a modulus value for 50-year life. The focus of the study outlined in this project submission will be to establish the resistance of the applied resin layer to external buckling, its ability to contain internal pressure and also its ability to accommodate any thermal expansion and contraction expected during the lifetime of the installation.

Nominated Contact Email Address(es)

Innovation@cadentgas.com

Problem Being Solved

Under the HSE's Enforcement Policy for the Replacement of Iron Gas Mains 2013-2021, all Tier 1 iron mains are to be decommissioned by the end of 2032 or earlier. National Grid Gas (NGG) has commissioned a programme of work, known as Pipe Replacement In Situ Manufacture (PRISM), to develop a new pipe replacement technique, which incorporates the application of a spray applied resin. Using this technique, the existing cast iron pipe is used as a former to allow the new pipe to be established through the PRISM application process. A proof of concept study has already been undertaken (Project Ref. NIA_NGGD0054 refers) and whilst some further development is required, it has established the process for potential use in cast iron gas distribution pipelines.

As the current definition for decommissioning of the host cast iron pipe suggests that any replacement pipe is required to be a stand-

alone system, with no support from the host pipe following installation, there is a need to better understand the performance and potential lifetime of the new PRISM installation. The proof of concept study considered some of the application requirements in terms of sealing existing corrosion holes and cracks, accommodation of ferrules and plugs etc. The next set of testing should consider the impact of subsequent failures of the host pipe following PRISM application e.g. as the host pipe starts to deteriorate and begins to fracture.

Method(s)

There are a number of tests that can be done to establish whether the applied PRISM can withstand the initial host pipe fracture as well as accommodate the fracture long term e.g. as the host pipe continues to move with the surrounding ground over time. The testing will confirm whether the applied resin layer can maintain its integrity as the host pipe is subjected to a range of axial and vertical movements.

Scope

As the host pipe could potentially fracture the day after PRISM application or tens of years later, consideration needs to be given to the impact of ageing of the applied resin. The testing will need to consider the saturation and ageing of the resin in a gas main environment and this will be undertaken separately by 3M, the manufacturers of the resin. The focus of the study outlined in this project submission will be to assess the suitability of the applied resin layer for use as a long term stand-alone pipe as more of the PRISM pipe becomes exposed to the surrounding environment following the continuing deterioration of the host pipe.

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Objective(s)

The completion of these tests will provide a key determinant in the assessment of the technical viability of the PRISM solution.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Of the two reports being produced from this project, the first will provide interim confirmation of the ability of the applied resin layer to resist the initial internal and external loading as the host pipe begins to deteriorate and fail. This will inform a decision to continue with the remaining programme activities. The second and final report will complete the assessment of the ability of the applied resin layer to continue to resist the applied loading throughout the lifetime of the installation. This will confirm that the lifetime of the resin material is sufficient to validate the technical and commercial viability of the solution, leading to full commercialisation.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

This project will utilise samples sourced from other projects within the overall PRISM programme as inputs to the testing protocols. The interim output report will determine the feasibility and strategy for the remainder of the PRISM programme and the final report will confirm commercial viability - this can be shared with the other GDNs.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

The testing will be undertaken by MACAW and their appointed sub-contractors in the Newcastle-upon-Tyne area.

Revenue Allowed for the RIIO Settlement

Tier 1 mains replacement/risk removal under Efficient and Safe Work Delivery and Removal of Risk.

Total Repex in allowance = £3.2bn.

Allowances as per Ofgem RIIO-GD1 Final Proposals and all figures are in 2009/10 prices.

Indicative Total NIA Project Expenditure

£224,698 total external spend (including contingency), payable to MACAW.

Total National Grid NIA Spend (including Internals and contingency) £299,597

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 cost savings will be attributable to the delivery of the PRISM Programme. This project forms a key enabler in the delivery and solution commercialisation will not be possible unless the success criteria are met.

Please provide a calculation of the expected benefits the Solution

Not applicable – research only

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

This PRISM solution which this project enables could be applied across GB and beyond. The scale will vary for each Network Licensee.

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

Rollout costs will consist of equipment purchase or hire, training costs and the cost of any required changes to relevant national or local policy for this work type. All costs will vary with the level of take up both locally within each GDN and from a national perspective. It is expected that these costs will be significantly outweighed by the benefits but a figure is difficult to propose at this stage due the variables highlighted.

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

Learning generated will be in the form of an output report.

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 long-term life of the materials used in the proposed PRISM solution must be verified prior to commercialisation.

☑ 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