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_NGGT0009

Project Registration

Project Title

Removable Composite Transition Pieces (CTP)

Project Reference Number

NIA_NGGT0009

Project Licensee(s)

National Gas Transmission PLC

Project Start

July 2013

Project Duration

3 years and 1 month

Nominated Project Contact(s)

Paul Ogden

Project Budget

£632,000.00

Summary

The National Transmission System (NTS) has approximately 300 locations where large diameter gas transmission pipes pass through reinforced concrete walls (e.g. into valve pits). Currently a variety of seals are used to prevent water, soil and pipe surround materials from passing through the interface between the wall and pipe. Many of these seals are known to be failing (e.g. allowing seepage and grit etc. to enter the space between the pipe and surrounding concrete) typically due to the breakdown of the seal materials and /or settlement of the pipe.

Where such failures are occurring there is the risk that the protective coating to the pipeline is being damaged and corrosion taking place. With evidence of seal failure and potential pipeline damage, current practice involves major works to cut out significant volumes of reinforced concrete around the pipeline to expose the seal, enabling inspection and repair. This is then followed by reconstruction of the reinforced concrete wall and replacement of the transition seal. Significantly more concrete must be removed than would ordinarily be necessary to allow for inspection and repair of the seal. Important areas of the existing reinforcing material need to be exposed to enable effective reinstatement of the concrete wall. The reconstruction process is complex, high risk, time consuming and inevitably creates difficulties in achieving good seals to the older concrete and to the new transition seal.

This process is currently undertaken on approximately 10 occasions annually and is likely to increase due to increasing age of the asset. In the event of future seal failure / further pipe settlement, the entire process would need to be repeated with the risks of progressive weakening of the reinforced concrete wall.

Third Party Collaborators

Haydale Composite Solutions

Nominated Contact Email Address(es)

Box.GT.Innovation@nationalgrid.com

Problem Being Solved

The project looks to address costly, labour intensive and potentially high risk works involved in the access, repair, removal and replacement of failed seals located on gas pipe exiting at concrete inspection pits.

Method(s)

- Feasibility study into concept and solution identification. Short list two concepts and propose options for installation and removal of the component.
- Concept design and design verification with G35 and G17 approvals. Fabrication and workshop testing of composite unit. Issue report of test results and any implications. Redesign, test and produce final report following any modifications as a result of initial tests.
- Identify two locations to conduct field trials which provide examples of different test conditions and produce final report.

The project has progressed to an additional stage and the change requirements outlined below have necessitated an increase in the overall budget and time:

- The field trials in phase 2 were prolonged due to a need for de-watering on site. In practice this meant that the actual head of water encountered was more than anticipated by the team. But the benefit of the increase in water pressure meant the Gas Transition Piece (GTP) unit was satisfactorily subjected to higher water pressures than expected and captured the associated learnings. Whilst being a successful field trial, this phase of work resulted in more than anticipated useful learning points, which have lead to required modification to the GTP unit design in Phase 3.
- In reviewing sites to identify one suitable for the live trial during Phase 3, a number of situations were identified that have further influenced modifications to the GTP design in order to accommodate future GTP use. As a result, phase 3 now includes formal designs of these modifications such that the final design and a number of approved modifications can be included in the Standard Design documentation.
- The design developments in phase 3 were completed based on the learning points from Phases 1 & 2. In preparing the designs further, developments have been identified to improve the GTP design and its suitability for wider use. Examples include; the need to create a ‘flat bottomed’ variant due to the close proximity of pipelines to pit floors and to develop designs and manufacture tooling for the range of pipe sizes typically encountered.
- The Phase 3 work was initially delayed due to the need to identify a suitable operational site which has a suitable pipe size, was experiencing transition wall failure and had a planned outage that we could work within.

In developing the operational technique for installation, it has been recognized that there is the potential to be more innovative and if proves practical to avoid the need for excavation on the outside of the pit by the injection of polyurethane foam to prevent the ingress of water and soils during installation and subsequently on any future GTP removal. This is an extension in the scope necessitating a cost and time increase but if it proves practical will make significant reductions in excavation costs, temporary worksite disruption, installation time and in the associated risks.

The project in now in the final stages and additional costs were incurred associated with extra internal time and resources in order to finalise acceptance of final designs and product specifications prior to full business roll out.

Scope

The National Transmission System (NTS) has approximately 300 locations where large diameter gas transmission pipes pass through reinforced concrete walls (e.g. into valve pits). Currently a variety of seals are used to prevent water, soil and pipe surround materials from passing through the interface between the wall and pipe. Many of these seals are known to be failing (e.g. allowing seepage and grit etc. to enter the space between the pipe and surrounding concrete) typically due to the breakdown of the seal materials and /or settlement of the pipe.

Where such failures are occurring there is the risk that the protective coating to the pipeline is being damaged and corrosion taking place. With evidence of seal failure and potential pipeline damage, current practice involves major works to cut out significant volumes of reinforced concrete around the pipeline to expose the seal, enabling inspection and repair. This is then followed by reconstruction of the reinforced concrete wall and replacement of the transition seal. Significantly more concrete must be removed than would ordinarily be necessary to allow for inspection and repair of the seal. Important areas of the existing reinforcing material need to be exposed to enable effective reinstatement of the concrete wall. The reconstruction process is
complex, high risk, time consuming and inevitably creates difficulties in achieving good seals to the older concrete and to the new transition seal.

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Objective(s)

The research and development of a removable Composite Gas Transition Seal Unit.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Application of knowledge gained during the feasibility study, concept design and field trial of a removable composite gas transition seal unit that is fit for purpose.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

Field trails will be held at two locations on the National Transmission System (NTS) which will be identified during the third stage of this programme of work.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

The National Gas Transmission System in the UK.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£230k

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)

Projected construction cost savings are expected, in terms of cost and materials of approximately £70k per annum, based on saving approximately 35% of the £20k typical cost of each transition piece project and assuming 10 are completed annually.

Savings associated with reduced environmental and safety risks:

- the use of light weight units would enable installation and removal without the use of mechanised equipment near high pressure gas pipes which in turn reduces safety risk.
- environmental risk/impact is reduced based on a reduction in the volume of concrete to be removed for transition inspection and repair and avoidances of any future need to remove reinforced concrete around the pipe.

Please provide a calculation of the expected benefits the Solution

Not applicable (Research)

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

This programme of work facilitates the potential to have a direct impact on the Gas Transmission Network. Based on the research and development of a removable composite transition design, a standard composite unit can potentially be produced for the range of pipes on the National Transmission System (NTS).

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

These would only be installed when existing transition wall seals need to be renewed. The business case allows for replacing 10 per year at an estimated annual cost of £200k, with the replacement transition pieces this would potentially be reduced to approx. £130k.

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

n/a

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

This project is aligned to Optimising Asset Management within the Reliability theme.

☑ 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