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NIA Project Registration and PEA Document

Date of Submission

Oct 2018

Project Reference Number

NIA_WWU_053

Project Registration

Project Title

Review of Pipeline Girth Weld Inspection

Project Reference Number

NIA_WWU_053

Project Licensee(s)

Wales & West Utilities

Project Start

October 2018

Project Duration

0 years and 8 months

Nominated Project Contact(s)

Daniel Wyatt – Wales & West Utilities Jon Todd – Northern Gas Networks Jeff O'Donnell – Cadent Keith Ellison - SGN

Project Budget

£198,612.00

Summary

This project will undertake a literature review and engineering assessments, including an independent peer review, that will drive revisions to current methods used when assessing the risk of pipeline girth weld failure

Nominated Contact Email Address(es)

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Problem Being Solved

The methodologies/work procedures required when working on pipelines containing defective girth welds or girth welds of unknown quality were first developed in 1994.

In the light of new developments in both the understanding of materials stresses in the areas of welds (such as fracture mechanics methods) and the geotechnical assessment of excavation effects (such as soil/pipeline interaction analysis), are considered to be overly conservative. This conservatism results in the escalation of costs when dealing with pipelines of unknown quality.

Method(s)

The aim of this project is to carry out a complete review of the latest information relating to the defect tolerance and axial stresses on pipe girth welds during excavation related activities; and propose revisions for methods applied to working on pipelines containing defective girth welds or girth welds of unknown quality.

A phased approach is proposed in order to deliver results efficiently and as they become available. The overall project scope has been divided into two stages which are listed below. Phase 1 involves in undertaking literature review and, Phase 2 involves in undertaking engineering assessments as required.

Scope

Phase 1: Literature Review

A literature review will be undertaken to determine the scope for improvement on working on defective pipelines. A summary report will be issued covering all the work undertaken as part of the Phase 1. This phase of the work confirm the belief that sufficient benefit is achievable then only Phase 2 part of the project will commence.

Phase 2: Engineering Assessments

Based on the recommendations of the literature review, detailed engineering assessments based on the new understanding in the applicable fields of knowledge will be undertaken. One technical report will be issued covering the re-evaluation of the current state of knowledge.

Objective(s)

To carry out a complete review of the latest information relating to the defect tolerance and axial stresses on pipeline girth welds.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

he project will produce recommendations which if accepted could reduce:

1. The size of the excavations required.
2. The related personnel exposure.
3. Stresses arising from excavation.
4. Time Spent completing the work.

Project Partners and External Funding

Project partners: DNVGL and Pipeline Integrity Engineers (PIE) ltd.

This project is wholly funded by the Network Innovation Allowance

Potential for New Learning

The main learning expected to be developed during this project is as follows:

- The procedures required for the examination of pipelines of unknown quality could become more efficient and potentially far less costly to apply as the need for pipeline shutdowns or pressure reductions could be significantly less onerous in light of latest developments.
- The increased understanding of the effects of both welding defects and of soil movement during excavation and other work near the pipe being investigated/worked on could allow an optimised assessment of the necessary actions and understanding of risk.
- An overall increase in efficiency arising from methodology change may lead to a significant reduction in cost when excavating or undertaking construction activities within the vicinity of pipelines.
- Through the re-evaluation of the new knowledge in fracture and soil mechanics, the gas industry is likely to achieve substantial cost and time reduction on works such as excavations and pressure reductions.

Scale of Project

This project is done at the relevant scale which is both a desk top study & engineering assessments. Anything less than this approach would mean no meaningful results could be obtained from the project.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL6 Large Scale

Geographical Area

The project will be relevant to all GDN areas.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

The total Project cost is £198,612; with external costs: £148,959 and Internal costs: £49,653

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)

It is believed that the after the research is completed there could be savings relating to both the size of excavations required and also time Spent completing the work.

Please provide a calculation of the expected benefits the Solution

Although it is difficult to provide an accurate prediction of annual savings that may be achieved through this work without actually having undertaken the investigation, an estimate can be made assuming a number of excavations are avoided as a result of the project. The soil mechanics review could enable a network to risk assess out the need to inspect welds within 20 pipe diameters of the main excavation, when carrying out stopples on P18 pipelines in good firm ground. If a network fitted on average 3 epoxy shells per year, a conservative estimate could see a reduction of 2 excavations per shell fitted with a cost of £7k per excavation, potentially achieving an annual cost saving of £42k. However this figure would be highly dependent on the outcome of the project.

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

All networks follow the P18 procedure and any future amendments to P18, that this project could influence, would be accepted by all networks. Hence why this project is a fully collaborative project between all GDN's.

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

This project has the potential to influence any future updates of P18, the cost of roll out would be be associated with this update. This is out of scope of this project however.

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 trialed 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

This project is a collaboration with all GDN's in the UK and therefore the outputs will benefit all network licenses.

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.

No other similar project has been 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

The current defect acceptance limits for girth welds were developed from the results of 68 full scale tests carried out in 1989/90 on 18" diameter pipelines with grossly defective girth welds. Since then other reviews have been published with full scale test data from tests on girth welds in vintage pipe. Soil/Pipeline Interaction Analysis (SPIA) techniques have advanced dramatically with new software available that is more accurate in modelling Soil/Pipeline interaction. The project also reviews what modern NDT techniques are available for all aspects of girth weld examination, including Long Range Ultrasonics (LRA), otherwise known as guide wave ultrasonics and Stress Concentration Tomography (SCT). The innovative aspect of this project is that whilst there have been developments in individual aspects, nothing has been done that looks at all of these developments together and the collective impact on current working methodologies/procedures.

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

The networks do not have the technical capability to or ease of access to the required information to undertake the project.

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

Although the project should deliver operational savings it is difficult to make an accurate without actually having undertaken the investigation, which is a risk to all networks.

This project has been approved by a senior member of staff

Yes