nationalgrid

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

Apr 2015

Project Reference

NIA_NGGT0067

Project Registration

Project Title

Sensitivity and Specificity of Stress Concentration Tomography – I CASE award

Project Reference

NIA_NGGT0067

Project Licensee(s)

National Grid Gas Transmission

Project Start

November 2014

Project Duration

4 years and 1 month

Nominated Project Contact(s)

Peter Martin

Project Budget

£159,691.00

Summary

As previously stated, the key issue relates to pipelines which cannot be internally inspected and the risk of corrosion, caused by disbondment of coating systems, primarily coal-tar enamel, on buried pipelines.

The standard approach to identifying and controlling metal loss on buried pipelines is to conduct in-line inspection (ILI) surveys. Where sub-critical defects are detected by ILI, the level of cathodic protection (CP) is managed in conjunction with Close Intervals Potential Surveys '(CIPS). Pipelines which cannot be internally inspected are managed through an "OLI4" survey which consisting of (CIPS) in conjunction with a coating defect survey e.g. Pearson or DCVG (Direct Current Voltage Gradient).

There are a number of limitations associated with current methodologies and this is of increasing concern as the asset ages. The SCT inspection system has the potential to identify defects and features which are currently not detectable using existing techniques thereby reducing the risk of failure on such pipeline systems.

A development project associated with SCT is underway NIA_NGGT0044, however it has been established that would be significant benefit to a more detailed look into comparing SCT data collected to data and conventional ILI data. As such this project, co funded by EPSRC is an industry sponsored CASE award targeting the sensitivity and specificity of the SCT technique. The student will use a mix of experimental and theoretical tools for the Non Destructive Testing (NDT) of ferrous materials and small laboratory based experiments will be used to inform much larger studies which will be performed on industrial test sites under the guidance of collaborators National Grid. The project is a collaboration of the School of Electronic and Electrical Engineering and the School of Physics within the University of Leeds.

Nominated Contact Email Address(es)

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Problem Being Solved

The key problem relates to pipelines which cannot be internally inspected and the secondary problem is the risk of corrosion, caused by disbondment of coating systems, primarily coal-tar enamel, on buried pipelines.

There are a number of limitations associated with current methodologies and the SCT inspection system has the potential to identify defects and features which are currently not detectable using existing techniques thereby reducing the risk of failure on such pipeline systems.

Method(s)

This project is an industry sponsored CASE studentship. The key deliverables are as follows:

Review existing pipeline routes scanned through pre-existing surveys. Together with additional satellite positioning data, carry out a detailed review and comparison of known locations (±2m) of In-Line-Inspection (ILI) with SCT. The emphasis of the analysis will be on defect characterisation/categorisation.

Laboratory based study of defects manufactured in pipes. This study will aim to re-create features discovered in objective 1 with the aim to explore reliability and repeatability of measurements.

Investigate conditions for SCT performance.

a. Perform repeat hydrostatic testing on defects created in 2 to determine the relationship between pressure cycling and magnetic features.

b. Investigate the effect of ILI runs on the base characteristics of the pipeline. Initially laboratory based experiments will be conducted simulating the effect of ILI runs in lab-based pipes. Hydrostatic testing will be performed to re-create operational conditions for the build-up of stress.

In collaboration with NG the project will seek to collect field data with measurements, before, during, and periodically after ILI.

Scope

As previously stated, the key issue relates to pipelines which cannot be internally inspected and the risk of corrosion, caused by disbondment of coating systems, primarily coal-tar enamel, on buried pipelines.

The standard approach to identifying and controlling metal loss on buried pipelines is to conduct in-line inspection (ILI) surveys. Where sub-critical defects are detected by ILI, the level of cathodic protection (CP) is managed in conjunction with Close Intervals Potential Surveys '(CIPS). Pipelines which cannot be internally inspected are managed through an "OLI4" survey which consisting of (CIPS) in conjunction with a coating defect survey e.g. Pearson or DCVG (Direct Current Voltage Gradient).

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Objective(s)

To investigate sensitivity, reliability and repeatability of data generated through the SCT technology particularly in relation to conventional inline inspection data.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Publication of a technical paper / thesis on the work with discussions on the findings, recommendations and suggestions for further work.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The project will be desk based, and involve laboratory scale work with limited field fields.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

The project will take place at the University of Leeds campus, with some field work on National Grid Gas Transmission sites.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

Gas Transmission NIA expenditure - £90,167

EPSRC contribution - £69,524

Total expenditure - £159,691

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)

Benefits associated with the SCT system are predominantly associated with two aspects of pipeline inspection, excavations and "unpiggable" pipelines. Financial benefits are estimated to be in the region of £200 k/year.

Please provide a calculation of the expected benefits the Solution

N/A research project

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

The SCT inspection system could be used on steel pipeline networks worldwide. Anticipated use would be on pipeline sections that can't currently be inspected by ILI.

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

Estimated cost of running SCT - £20k per inspection, depending on length of survey – this includes survey team, processing and production of report.

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)

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.

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