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

Nov 2017

Project Reference Number

NIA_NGGT0122

Project Registration

Project Title

EMAT – In-line Coating Disbondment Detection Assessment

Project Reference Number

NIA_NGGT0122

Project Licensee(s)

National Gas Transmission PLC

Project Start

November 2017

Project Duration

0 years and 7 months

Nominated Project Contact(s)

Kirsty McDermott; box.GT.Innovation@nationalgrid.com

Project Budget

£170,500.00

Summary

CIPS are carried out to detect coating disbondment on the pipeline but this is only detection is only location not circumferential position. This lack of accurate circumferential information increases any potential maintenance costs as excavations need to be larger to ensure exposure of the reported features.

The majority of National Grid's pipelines are coal tar coated. Over time, there can be regions of localised coating disbondment which, if not detected by the CIPS techniques, will inhibit the cathodic protection in that region potentially resulting in pipeline corrosion. If this disbondment occurs at the base of the pipe, the situation is exacerbated as CIPS has been shown to not reliably identify disbondment under these conditions. Other pipeline evaluation techniques, such as EMAT, have been show to provide coating condition and adherence information. This technology, when utilised as an in-line Inspection tool, offer considerable potential supporting the pipeline asset integrity assessment that are undertaken by National Grid.

This project will conduct an ILI EMAT trial alongside a scheduled MFL ILI run along the same transmission feeder section. This will provide a direct comparison of the technologies and allowing for verification of the ILI capability of the two methods in terms of:

- **Distribution of coating condition plots:** Number of joints per coating condition class for each 5,000m of pipeline length.
- **Coating condition per joint plot:** detected coating condition as percentage of joint area affected versus the pipeline length.
- **Coating Type per Joint:** Detected main coating type per joint versus the pipeline length
- **Pipe Tally:** All results of the inspection activities.

The trial will be the first use of the EMAT ILI vehicle in the UK and verification of it's suitability offers the potential for improved pipeline asset management through the continued use of the EMAT technology.

Third Party Collaborators

Nominated Contact Email Address(es)

Box.GT.Innovation@nationalgrid.com

Problem Being Solved

National Grid uses a close interval potential survey (CIPS) to check for coating disbondment on pipelines. Disbondment of the coating can be the precursor of corrosion and stress corrosion cracking due to impact that a lack of coating has on the pipeline protection systems such as cathodic protection. This makes it imperative that the pipeline is adequately inspected to accurately identify any coating disbondment. Currently the CIPs assessment does not guarantee positive readings as to whether disbondment has taken place as some defects are too small to detect or are shadowed by the pipe.

In-line Inspection (ILI) tools that utilise Electro Magnetic Acoustic Transducer (EMAT) technology are being developed and are claimed to be able to accurately determine areas of pipeline where there is coating disbondment. If this capability is proven, ILI EMAT technology would provide National Grid with greater flexibility and enable more informed decisions to be made in respect to coating disbondment greatly improving the on-going pipeline integrity assessments. ILI EMAT could provide a more detailed assessment of the pipe susceptibility for corrosion and cracking, indicating the course of action required (monitoring or localised excavation and remediation where necessary), leading to improved pipeline asset management.

Method(s)

This programme will evaluate a full ILI EMAT trial along a feeder on the National Transmission System known to be coal-tar wrapped, with the potential for coating disbondment. This EMAT ILI trial will be conducted in combination with the scheduled Magnetic Flux Leakage (MFL) ILI run along the same pipeline section. MFL does not have the capability for determining coating disbondment, therefore the use of the EMAT ILI will provide:

1. An Insight into the capability of an ILI tool for pipeline coating assessment as an alternative to conventional techniques such as CIPS.
2. Provide in-service evidence that ILI EMAT and MFL are interchangeable in respect to non-coating related determination (metal loss, wall thickness).

The EMAT ILI run data will be evaluated in accordance with NACE SP0204 Standards. This evaluation will presented in terms of full verification of data quality and features that may potentially be critical for the integrity of the pipeline such as:

- Distribution of Coating Condition plots.
- Coating Condition per Joint Plot.
- Coating Type per Joint.

The EMAT ILI results will allow for an informed decision to be made as to what action should be carried out in line with the following options:

- Monitoring the section of pipeline.
- Excavation and insert a shell.
- Replace the section of pipeline.

To verify the ILI EMAT capability, a pipeline excavation will be performed as part of the conventional ILI Dig programme in line with the findings from EMAT ILI data.

Following the EMAT ILI evaluation, further independent analysis will be carried out to advise what ILI inspection technology is the most appropriate for certain pipelines. This has the potential to act as a decision tool to inform the National Grid's on-going ILI strategy.

Scope

CIPS are carried out to detect coating disbondment on the pipeline but this is only detection is only location not circumferential position. This lack of accurate circumferential information increases any potential maintenance costs as excavations need to be larger to ensure exposure of the reported features.

The majority of National Grid's pipelines are coal tar coated. Over time, there can be regions of localised coating disbondment which, if not detected by the CIPS techniques, will inhibit the cathodic protection in that region potentially resulting in pipeline corrosion. If this disbondment occurs at the base of the pipe, the situation is exacerbated as CIPS has been shown to not reliably identify disbondment

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Objective(s)

To evaluate the effectiveness of ILI EMAT tool to detect coating disbondment.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The success will be measured by full verification, analysis and validation of the data confirming EMAT can detect coating disbondment.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

A full ILI trial will take place on one of National Grid gas transmission's pipeline.

Technology Readiness at Start

TRL7 Inactive Commissioning

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

A location on National Grid's gas transmission network.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£170,500

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)

If no defects were found the potential saving would be £366k this is based on a one section of a feeder.

A feeder could be approximately split into 10 sections therefore potential saving would be £3.66m; If the whole feeder was to be inspected.

Please provide a calculation of the expected benefits the Solution

Base cost - Repair carried out after a CIPS – Description of work for one feeder section

Mobilisation £45k

Excavation £196k

Maintain pit excavation £51k

P11 investigation works £67k

Remove and replace coating £39k

Backfill £53k

De- mobilisation/Site clearance £70k

Total £521k (CIPS indication of coating disbondment)

Method cost – using EMAT

EMAT ILI process £155k

If no faults were found, no additional work required.

Potential saving £366k

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

This technique has the potential to be used on distribution networks.

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

The In line inspection contract may need to be revised based on whether the EMAT tool will be run as combination tool with MFL or as a stand-alone.

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

The learning can be used across the Network Licenses to potentially assist with the identification and characterisation of coating disbondment with their network.

This technique does not impact industry standards (which are to inspect pipelines) but it is advantageous that National Grid has a better asset understanding to identify this issue.

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

Reliability

☑ 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