national gas transmission

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

May 2014

Project Reference Number

NIA_NGGT0054

Project Registration

Project Title

Pipeline damage measurement using handheld laser scanners

Project Reference Number

NIA_NGGT0054

Project Licensee(s)

National Gas Transmission PLC

Project Start

May 2014

Project Duration

0 years and 7 months

Nominated Project Contact(s)

James Gilliver, box.GT.innovation@nationalgrid.com

Project Budget

£32,000.00

Summary

A review of available hand held laser scanning technologies has previously been undertaken by National Grid Gas Distribution reported in DNV GL technical note 14232. This review identified that the hand held laser scanners may be of use for measuring and recording damage to pipelines. This proposed scope of work is a follow on to this literature review to assess the identified devices fitness for purpose for the National Grid Transmission System.

Pipeline damage in National Grid Gas specification T/SP/P/11 is currently undertaken using a number of manual measurement tools by trained technicians. For complex areas of damage it is time consuming to carry out the detailed measurements required to enable the mechanical damage assessor to perform the required calculations. In addition obtaining accurate measurements is made even more difficult due to access for example damage to the bottom of the pipe. The dar photographs and a rubbing of the damage and hand written results.

Fixed laser scanners (terrestrial laser scanners) have been used in the past to produce 3D models of pipework. However, their use is limited due to their accuracy and the required setup of the systems onsite. Hand held laser scanners have been developed which reportedly require minimum setup and provide greater accuracy than the terrestrial laser scanners. The damage is recorded in a 3- diensionsal model which includes relevant measurements required to make an assessment of the damage. The use of these types of scanners has not previously been assessed to determine the suitability for assessing pipeline damage.

Third Party Collaborators

DNV

Nominated Contact Email Address(es)

Box.GT.Innovation@nationalgrid.com

Problem Being Solved

Pipeline damage measurement in National Grid Gas specification T/SP/P/11 is currently undertaken using a number of manual measurement tools by trained technicians. Depending on the location on the pipe, the type of damage and the complexity this can be time consuming due to the high level of accuracy required.

Method(s)

This project will compare the hand held laser scanner to the current in T/SP/P/11* and in T/SP/P/20** methods measuring different types of defects - corrosion damage, dent, and gouge, across different pipe sizes. The accuracy, speed of result gathering, simplicity of use, portability and reporting of these methods will be compared. The measurement results from this system will be reviewed against the measurement accuracy requirements for in T/SP/P/11 and in T/SP/P/20.

Deliverables include:

- Identify suitable laser scanning equipment.
- Carry out laser scanning of damaged pipe sections that are currently stored at PMC Ambergate.
- Comparison of measurement results from laser scanning and manual measurement techniques.
- Report reviewing results and recommendations for use in T/SP/P/11 for onsite damage assessments.

* T/SP/P/11 - Management Procedure for inspection, assessment and repair of damage (non-leaking) steel pipelines above 150mm nominal diameter and designed to operate at pressures greater than 2 bar.

** T/SP/P/20 - Management procedure for inspection assessment and repair of damaged (non leaking) steel pipelines and pipework up to 150mm nominal diameter designed to operate at pressures greater than 2 bar.

Scope

A review of available hand held laser scanning technologies has previously been undertaken by National Grid Gas Distribution reported in DNV GL technical note 14232. This review identified that the hand held laser scanners may be of use for measuring and recording damage to pipelines. This proposed scope of work is a follow on to this literature review to assess the identified devices fitness for purpose for the National Grid Transmission System.

Pipeline damage in National Grid Gas specification T/SP/P/11 is currently undertaken using a number of manual measurement tools by trained technicians. For complex areas of damage it is time consuming to carry out the detailed measurements required to enable the mechanical damage assessor to perform the required calculations. In addition obtaining accurate measurements is made even more difficult due to access for example damage to the bottom of the pipe. The damage is then recorded by means of taking photographs and a rubbing of the damage and hand written results.

Fixed laser scanners (terrestrial laser scanners) have been used in the past to produce 3D models of pipework. However, their use is limited due to their accuracy and the required setup of the systems onsite. Hand held laser scanners have been developed which reportedly require minimum setup and provide greater accuracy than the terrestrial laser scanners. The damage is recorded in a 3-diensionsal model which includes relevant measurements required to make an assessment of the damage. The use of these types of scanners has not previously been assessed to determine the suitability for assessing pipeline damage.

Objective(s)

Assess the performance of hand held laser scanners for measuring damage to pipelines when compared to methods currently used in T/SP/P/11 and T/SP/P/20. If the assessment is successful, update of T/SP/P/11 and T/SP/P/20 to include hand held laser scanning methods for measurement of pipeline damage.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Complete assessment of hand held laser scanners to determine whether they are capable of measuring the damage within the tolerances specified in National Grid Gas specification for traditional measurement methods. The use of the hand held laser scanners reduce the time taken to carry out measurement of the damage and the accuracy. In addition, if successful, this would reduce the exposure to risk of the P/11 technician with reduced time required in excavations to obtain the required measurements.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

A comparison is required of the use of these lasers scanners to the methods included in T/SP/P/11 for all types of damage that are assessed on a regular basis by National Grid. It is not known how the laser scanners will perform on different types of damage for example corrosion or a dent. If the systems are to be incorporated it is necessary to prove the accuracy on a range of damage types. The results of the measurements are used by trained mechanical damage assessors to carry out calculations that will determine the course of action for repair of the damage. Inaccurate results may result in the incorrect course of action following the measurement.

Technology Readiness at Start

TRL5 Pilot Scale

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

The project will be undertaken at DNV GL in Loughborough for the desktop based work, at National Grid Pipeline Maintenance Centre, Ambergate to trial the device in a working environment.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£32k

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)

Direct cost savings of approximately £18,000 is estimated on an annual basis.

Please provide a calculation of the expected benefits the Solution

Based on an 8hr day, a technician cost is approximately £600 per day (£75 per hour). For a relatively simple area of general corrosion (100 mm x 100 mm) it will take a technician 3 hrs to carry out record the measurements. It is considered that with hand held laser scanners the setup, measurement and recording of the results could be completed within 1hr, saving 2hrs on the manual measurement methods. It is estimated there are ~120 assessments per year from inline inspection (approx 50), day to day assessments (approx 50) reported and pipe support project, (approx 20).

Base cost: using the manual method the cost for measurements = 3 days x 75 hours = £225

Total cost for the year using manual method = £225 x 120 = £27000

Method cost: using the laser scanning method = 1 day x 75 hours = £75

Total cost for the year using hand held laser scanners = £75 x 120 = £9000 (plus additional benefits listed below)

Additional benefits:

The benefits outlined below are expected to be significantly higher in value than the direct cost savings.

When damage is found on a pipeline pressure restrictions have to be put in place for the safety of the technicians carrying out the examinations. In addition to the cost benefits above, the use of hand held laser scanners will provide significant benefits where multiple examinations are required on one installation or pipeline. In recent experiences where many corrosion features (more than 20) have been found on an installation, pressure restrictions may be in place for a number of days, in some cases an outage may even be required for the pipeline/installation. It is not possible to quantify, however a shutdown can result in significant costs depending on the implications, for example in terms of constraint management actions. With the use of a hand held laser scanner the results would be obtained in significantly shorter time period (approximately 2 hours saving per assessment) and result in the pipeline restrictions or shutdowns being in place for shorter periods of time which will also lead to less customer interruption.

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

If successful this method of assessing pipework damage could be rolled out across all sites in GB and across all networks.

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

To roll out the method across GB, a training course will be required to train the current and any new technicians on how to use and calibrate the equipment. Currently National Grid P/11 technicians have to undertake a re-assessment every 3 years. It is considered that a 1 day training course on the equipment followed by assessment to demonstrate capability of the equipment will be required. In most cases re-training and assessment of the technicians would be carried out when their current P/11 certification expires and therefore no additional training costs would be incurred.

Equipment for carrying out the P/11 measurements is purchased, maintained and calibrated at the expense of the contractors used by National Grid. If required by National Grid the estimated cost of each laser scanner is £30k however, costs for the laser scanning units will dependant on options for purchasing in bulk or hiring the equipment if this is feasible.

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

Findings will be relevant to licensees with a requirement to undertake mechanical damage measurement.

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 fits within the Safety and Reliability themes.

☑ 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