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 2013

Project Reference Number

NIA_NGGT0041

Project Registration

Project Title

On Site Chemical Analysis of Pipeline Materials

Project Reference Number

NIA_NGGT0041

Project Licensee(s)

National Gas Transmission PLC

Project Start

September 2013

Project Duration

0 years and 5 months

Nominated Project Contact(s)

Richard Wilkinson – Project Manager,
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Project Budget

£30,000.00

Summary

When construction records are incomplete, the in-situ sampling of pipe or fitting materials to establish material type and composition is needed to allow safe and reliable connections to be made to the pipeline network.

A quick reliable, accurate and cost effective method to determine in-situ pipe or fitting material chemical compositions is required. When combined with hardness tests and/or other analysis the material composition values will allow the component material grade to be estimated.

Third Party Collaborators

ROSEN

Nominated Contact Email Address(es)

Box.GT.Innovation@nationalgrid.com

Problem Being Solved

Before welding on existing pipelines or installations National Grid need to positively identify pipe and fitting material type, chemistry and strength. On some of the older existing pipelines and above ground installations (AGIs), records may be incomplete or unavailable to provide confirmation of material properties and composition. It is usually impractical to remove a section of existing in-service pipe to carry out mechanical testing for characterization purposes therefore in-situ pipe material sampling is necessary.

Current practice is to remove fine cutting samples from the pipe surface and send these to a laboratory for analysis and to evaluate the results. This process usually takes 3 to 4 days. A reliable method of material sampling that will deliver results in an improved timescale

is desired.

Method(s)

The suitability of using portable Optical Emission Spectrometry (OES) and X-ray fluorescence (XRF) techniques for site use to carry out material chemical analysis will be assessed via the following tasks:

Task 1

A comparative desk based study of chemical analysis techniques and equipment available for site use will evaluate expected analysis performance, including minimum measurable element content, accuracy/error of analysis and range of elements which can be analysed.

The study will consider the size and ease of mobility of Optical Emission Spectrometry (OES) and X-ray fluorescence (XRF) equipment and excavation requirements to allow access of the equipment to existing pipelines.

A risk assessment will be carried out for the use of portable chemical analysis equipment on live gas sites to relevant health and safety standards and once suitable products for field trials in Task 2 have been identified an assessment criteria will be developed to rank the available options.

Task 2

A field trial will be carried out by MACAW Engineering Ltd. and the manufacturer's representatives (which will be witnessed by a National Grid) to assess the performance of up to three different manufacturer's equipment.

The trial will be performed on a range of different pipe/fitting material types, grades, diameters and ages. Carbon manganese steels, and a limited range of stainless steel and aluminium pipe or fittings are included within the scope of testing.

Each pipe or fitting sample will have the chemical analysis evaluated using at least three of the methods described below for comparison of accuracies.

- Portable OES
- Current material sampling procedure – laboratory OES/ICP analysis
- Review of mill certificates where available
- Optional: Laboratory OES analysis of a material coupon sample from the pipe or fitting being sampled

The field trials will take place at the National Grid PMC Ambergate and the practicality of using the chosen equipment outdoors under site conditions will be assessed and any limitations reported.

Given a successful outcome to the trials a method statement will be developed for the use of OES/XRF equipment on National Grid sites.

A written report detailing the findings of these field trials will be produced by MACAW Engineering Ltd.

Scope

When construction records are incomplete, the in-situ sampling of pipe or fitting materials to establish material type and composition is needed to allow safe and reliable connections to be made to the pipeline network.

A quick reliable, accurate and cost effective method to determine in-situ pipe or fitting material chemical compositions is required. When combined with hardness tests and/or other analysis the material composition values will allow the component material grade to be estimated.

Objective(s)

The objective is to determine if current portable Optical Emission Spectrometry (OES) or X-ray Fluorescence (XRF) equipment will meet National Grid requirements for material sampling and reduce operational costs.

The information provided by OES/XRF, if found to be accurate during this study, will supplement existing records and will achieve a reduction in the time required to sample materials.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Review and assessment of Portable Optical Emission Spectrometry (OES) and X-Ray Fluorescence (XRF) equipment for on site chemical analysis of pipeline materials. Confirmation that the accurate determination of pipe/fitting material compositions using a new method while under site conditions has been validated and that a significant reduction in the time taken to complete the product analysis is possible.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

Review and assessment of the Portable Optical Emission Spectrometry (OES) and X-Ray Fluorescence (XRF) equipment in a working environment.

Technology Readiness at Start

TRL5 Pilot Scale

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

Knowledge gathered from the assessment of the OES & XRF equipment will be applicable for material testing on many of the pipelines and Above Ground Installations (AGIs) across the Gas Transmission System.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

Total project expenditure expected - £30k.

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)

A conservative estimate of the number of times material sampling is required by National Grid on an annual basis is around 50 times per year. The proposed solution would provide a savings of circa £25k per annum.

Please provide a calculation of the expected benefits the Solution

BASE: The current base cost for pipeline material sampling is an average of £1500 per visit. This can vary depending upon the site geographic location and the number of samples to be taken (e.g. duration of site visit).

METHOD: The expected Method cost, if the alternative equipment is found to be fit for purpose, is approximately £1000 per visit. This includes the cost of a service provider to carry out the sampling.

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

The pipe material sampling method could be applied to almost all pipelines and AGI sites across National Grid's Gas Transmission System.

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

The roll out cost for service providers to implement the alternative equipment will be determined once successful equipment technology is identified. The in-house costs will include the modification of the existing material sampling management procedure and dissemination by Team talks, etc... It is estimated that this will not exceed £5k.

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 outputs of this study will allow National Grid to determine if the use of portable OES equipment for material sampling is suitable to be added to T/PM/Q/10 and can be adopted by, and shared with Network Licensees that are subject to compliance issues being satisfied.

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