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

Jan 2014

Project Reference Number

NIA_NGGT0002

Project Registration

Project Title

Development of AC OHL survey system and evaluation of ER probes

Project Reference Number

NIA_NGGT0002

Project Licensee(s)

National Gas Transmission PLC

Project Start

October 2009

Project Duration

4 years and 5 months

Nominated Project Contact(s)

Peter Martin

Project Budget

£335,000.00

Summary

Alternating currents are induced onto pipelines running parallel with high voltage transmission lines. AC electrified railways give rise to combined risks to both the safety of personnel working on these lines and also through significant AC corrosion problems on that pipeline. Induced AC voltage and AC current density measurements can be made at any point on the pipeline to determine likely risk of AC corrosion. At present these measurements are only made at test posts and so little is known about the levels of AC interference between test posts. This means that potential significant corrosion causes may be missed. CIPS (Close Intervals Protection Surveys), which currently only addresses DC potential, are carried out between test posts but these will not show AC-driven problems. At present, although AC corrosion has been documented (through-wall failures have been recorded and corrosion rates as high as 1.4 mm/yr calculated) in the UK, mainland Europe and North America, there do not seem to be many solutions available or widely used for over line AC surveys.

It is believed that the capability to perform over line surveys collecting induced AC voltage, DC on/off potentials and AC current density measurements would give the most beneficial means of detecting areas of AC corrosion risk. There is therefore a requirement to establish a suitable device that can be used to perform these surveys along with a process for its operation.

The project therefore will deliver a specific piece of new equipment for use on the gas transmission network.

Third Party Collaborators

DNV

Nominated Contact Email Address(es)

Box.GT.Innovation@nationalgrid.com

Problem Being Solved

AC corrosion has been documented in the UK, mainland Europe and North America. Through-wall failures have been recorded and corrosion rates as high as 1.4 mm/yr calculated. Critically, these pipelines were not shown to have any defects during conventional DC close intervals protection surveys (CIPS). Increasing installation of power lines, rail transit systems and improvements to pipeline coating quality will all continue to increase AC
corrosion instances.

Method(s)

The project method is split into two key strands. The first is the development of a suitable over line AC survey system that will be used for the initial identification of areas where the levels of AC interference on pipelines may require mitigating action. There are three stages to this as follows:

- Stage 1 – Market survey
- Stage 2 – Provide and evaluate candidate device/system including trial the system on suitable pipelines
- Stage 3 – Knowledge dissemination and implementation presented to industry group

The second part of the project is the quantification AC corrosion rate on pipelines also involving three stages:

- Stage 1: Identification of probes suitable for measurement of AC corrosion rates
- Stage 2 : Laboratory evaluation
- Stage 3: Field evaluation of corrosion monitoring devices identified during the laboratory evaluation

Scope

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Objective(s)

The desired result is that the project deliver a suitable over line AC survey system, that when implemented, will enable the improved detection and assessment of AC-induced corrosion in gas pipelines, thereby reducing the likelihood of leakage or failure though this particular corrosion process.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Development of a suitable device that can be used to perform AC corrosion survey and a system/process for its operation across the National Transmission System.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The project involves laboratory trials of a number of different devices and field trials across a number of different locations. This is necessary in order for a device to be suitable for the wide range of conditions across the National Transmission System (NTS).

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL9 Operations

Geographical Area

Across the National Transmission System.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

IFI - £275k
NIA - £60k

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)

The cost of a corrosion failure (which would be a gas leak, rather than a catastrophic failure) would include the emergency repair costs and the costs associated with lost capacity. A fairly straightforward emergency pipeline replacement at short-notice would cost about £3m. A reasonable expectation of costs associated with lost capacity until the pipeline is repaired would be £5m. The total cost is therefore typically £8m.

The risk of corrosion-related failures on the NTS (including those caused by stray current; assuming pipelines with WT 12.7mm & OD 900mm; assuming an effective corrosion mitigation process is in place) is a 0.06 chance per million kilometres per year (source: PIPESAFE). The NTS has 7,500km of gas transmission pipeline. Having an effective mitigation strategy for corrosion therefore keeps the inferred annual cost of corrosion related
failures to only (0.06)*(£8m)*(7,500/1,000,000) = £3,600pa.

If NG does not develop the means to monitor, manage and mitigate the growing threat from AC induced stray currents, the above evidence suggests that there is a credible risk (e.g. 10%) of a pipeline failure occurring in the next 10 years due to AC stray current corrosion. This produces an inferred annual cost of (0.01)*(£8m)/(10) = £80,000pa minimum.

Please provide a calculation of the expected benefits the Solution

Base cost= £80k pa
Method cost= £40k (£3,600 per annum plus implementation)
Expected benefits = £40k pa

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

The device/system could be used across the whole of the gas transmission network.

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

Equipment purchase (10 off) £10,000 + Training (20 experienced surveyors) £15,000 = £35,000 is the likely cost of implementation.

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 information from the device and the new operating process will be used to detect and quantify AC corrosion anywhere along the pipeline in order that appropriate monitoring and mitigation measures can be put in place.

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 is aligned to Optimising Asset Management under the Reliability theme.

☑ 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