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

Oct 2016

Project Reference Number

NIA_SGN0092

Project Registration

Project Title

Pit Protect

Project Reference Number

NIA_SGN0092

Project Licensee(s)

SGN

Project Start

October 2016

Project Duration

1 year and 6 months

Nominated Project Contact(s)

Mark Skerritt, Innovation Project Manager NGGT – Paul Ogden (Senior Engineer – Civil Assets)

Project Budget

£287,655.00

Summary

Stage Gate 1- Execution & Research

Complete initial evaluations of the existing water ingress issues being faced by SGN and NGGT, in order to provide the Project Partner with a full understanding of the nature and extent of the pit wall water ingress problem. This initial evaluation, which will also require the Project Partner to visit a number of affected pit sites across SGNs and NGGTs networks, will in turn lead to the Project Partner determining the requirements for the formulation and application of the new coating repair technique, as well as proposing the expected success criteria that the selected material and delivery system will be measured against. Ending with the production of a comprehensive progress report to summarise the findings for this stage.

Stage Gate 2 - Production, Lab Testing & Field Trial Preliminaries

Construct a laboratory test rig to mimic pit conditions, then formulate, assess and refine the proposed coatings and primers. Laboratory trials will then be carried out to enable candidate selection and the subsequent procurement of the selected materials and deployment equipment. Undertake quality control testing, determine the success criteria needed to evaluate which coating material will be selected and ensure the coating equipment/delivery system will meet expected SGN and NGGT standards. Produce draft field trial documentation which fully supports the undertaking of live field trials on networks, including associated Risk Assessment and Method Statement (RAMS) documentation in advance of any field trials. Identify expected operational permitry requirements and prospective field trial dates. Ending with the production of a comprehensive progress report detailing the outcomes of the Laboratory trials.

Stage Gate 3 - Lab Scale-up & Field Trials

Produce the required volumes of coating material needed for field trials. Review field trial sites and RAMS; also finalise proposals to ensure compliance with SGNs policies and procedures, and submit for approval. Complete field trial(s) and produce a comprehensive field trial progress report detailing the outcomes.

Stage Gate 4 - Project Closure Reports

Production of a cost assessment and detailed final Project report to SGN and NGGT for approval.

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

A large number of assets within the Gas Distribution Networks (GDN's) and Gas Transmission (NGGT) are housed below ground in pits. The materials used to construct the pit walls are usually concrete, brick or fibreglass. Assets often require below ground installation due to a number of issues including, local planning requirements, local community preferences, acoustic or network configuration factors, etc.

Consequently, burying an asset, such as a Gas Regulator (aka Gas Governor), valve or associated instrumentation, requires the intended housing to be designed so that it should prevent water ingress affecting the assets performance. Unfortunately, not all pit housings are currently able to completely prevent water ingress and many fail, invariably leading to a flooded pit; resulting in GDN and NGGT personnel frequently being forced to pump out the affected pits to allow them the access they need to perform their maintenance activities.

There are a variety of reasons for the pits becoming flooded and a few examples of how water ingress can occur are listed below:

· Incorrect installation; the pit housing may have been damaged or flawed when it was originally installed.

· High water table; the pit location may have been placed within an existing, or developing, flood plain.

· Incurring damage; the pit housing may have been subject to land-slip, or other forces and stresses, causing the pit walls to fracture or buckle.

· Third party contaminant; a sewage or water pipe may have ruptured in proximity of the pit housing.

· Indirect damage; e.g. damage to the pit walls caused by vibration from road-works, road traffic, etc.

It would therefore be most beneficial to permanently repair and/or remediate any affected pits to prevent the issue of water ingress ever reoccurring.

Method(s)

The Project Partner (GnoSys) has identified two potential solutions, either using a waterborne polymer coating cured via (UV) irradiation or using an approach based on hydrophilic thermoplastic elastomers (h-TPEs) and both proposals are intended to be deployed either as a viscous fluid or melt spray deposition. They will also be subject to a full investigation and appraisal during this Project.

The Project will include the following stages:

· Execution & Research

· Production, Lab Testing & Field Trial Preliminaries

· Lab Scale-up & Field Trials

· Project Closure Reports

Scope

Stage Gate 1- Execution & Research

Complete initial evaluations of the existing water ingress issues being faced by SGN and NGGT, in order to provide the Project Partner with a full understanding of the nature and extent of the pit wall water ingress problem. This initial evaluation, which will also require the Project Partner to visit a number of affected pit sites across SGNs and NGGTs networks, will in turn lead to the Project

Partner determining the requirements for the formulation and application of the new coating repair technique, as well as proposing the expected success criteria that the selected material and delivery system will be measured against. Ending with the production of a comprehensive progress report to summarise the findings for this stage.

Stage Gate 2 - Production, Lab Testing & Field Trial Preliminaries

Construct a laboratory test rig to mimic pit conditions, then formulate, assess and refine the proposed coatings and primers. Laboratory trials will then be carried out to enable candidate selection and the subsequent procurement of the selected materials and deployment equipment. Undertake quality control testing, determine the success criteria needed to evaluate which coating material will be selected and ensure the coating equipment/delivery system will meet expected SGN and NGGT standards. Produce draft field trial documentation which fully supports the undertaking of live field trials on networks, including associated Risk Assessment and Method Statement (RAMS) documentation in advance of any field trials. Identify expected operational permitry requirements and prospective field trial dates. Ending with the production of a comprehensive progress report detailing the outcomes of the Laboratory trials.

Stage Gate 3 - Lab Scale-up & Field Trials

Produce the required volumes of coating material needed for field trials. Review field trial sites and RAMS; also finalise proposals to ensure compliance with SGNs policies and procedures, and submit for approval. Complete field trial(s) and produce a comprehensive field trial progress report detailing the outcomes.

Stage Gate 4 - Project Closure Reports

Production of a cost assessment and detailed final Project report to SGN and NGGT for approval.

Shortly after the project commenced it was agreed by all Project Partners that a below ground pit governor installation within SGNs South network, known as Brookdene Road DG, would be an excellent candidate to field trial the proposed new coating system. However, additional and unexpected costs have been incurred with the selection of this site for the following key reasons:

- Site consists of two large pits, not one pit as originally outlined for this project
- Access to the pit is only possible through closing the road
- Severe water ingress issues at this site, often lead to continuous flooding and sediment/detritus being left in the pit

Therefore, further funding has now been secured to allow a field trial at this site to proceed; although this will not have any effect on the proposed end date for the Project.

Objective(s)

The objective of the Project is to prove the viability of using a purpose-designed pit wall coating and associated deployment equipment to prevent pit wall water ingress on the GB gas network.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The success criteria for the project are:

- Complete research into the nature and extent of Pit Wall Water Ingress, determine the ‘success criteria’ that the selected material and its delivery system will be measured against. Approval of Stage Gate 1 progress report.
- Complete construction of laboratory test rig, plus selection and procurement of the viable coating material(s), deployment equipment and lab test. Production of draft supporting documentation needed to demonstrate compliance with SGNs policies and procedures, and approval of Stage Gate 2 progress report.
- Complete the production of required volume of coating material for field trial(s) and review of proposed field trial sites. Approval of all supporting documentation, including RAMS. Completion of field trial(s) and approval of Stage Gate 3 progress report.
- Complete final Project report and cost assessment (providing details on the financial benefits that can be gained through using this new technique) for inclusion within the final report and submit both for approval. Approval of Stage Gate 4 final Project report.

Project Partners and External Funding

None

Potential for New Learning

The aim of the Project is to successfully develop a cost effective, long term solution to the current water ingress problem faced by the GDNs and NGGT. This new approach will be beneficial to all Network Licensees, as well as the UK Transmission Network Operator; and other Network Licensees will also be able to use the learning generated to embed this new solution into their own businesses. As a consequence, it is anticipated that this will enable cost reductions to be made to Network operations, along with improvements to UK customer satisfaction.

Scale of Project

This Project could not be carried out on a smaller scale: The candidate coating(s) and application method(s) will ultimately be subjected to live field trial testing at a suitable pit site(s); if this were not able to happen then it would not be possible to properly evaluate the suitability of the proposed pit coating material and its associated deployment equipment.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

The field trial element of this Project will be carried out on a live pit site within SGNs networks and if possible (project time constraints potentially having an influence) also consider a further trial at a live pit site within NGGTs network.

Revenue Allowed for the RIIO Settlement

During RIIO-GD1 SGN and NGGT will be required to attend a variety of assets buried in pits for both routine and emergency repair/remedial work. Many of these pit sites will be affected by flooding, requiring SGN and NGGT operatives to spend additional time pumping out the waste water.

Information regarding the full costs associated with this type of activity is still being researched, however, SGN estimate spending approximately £53.1m on Gas Regulator Modules (aka District Governors (DGs)), which will largely cover replacements, maintenance and inspections; and included within this expenditure will be remedial work needed to repair and replace pit governor assets. Whilst no direct saving is expected during the Project, it is anticipated that successful completion will have the potential to deliver savings, in regard to the time and money usually associated with safeguarding the integrity of buried network assets.

Indicative Total NIA Project Expenditure

The total Project expenditure is £287,655, 90% of which is allowable NIA expenditure (£258,890)

This is a collaborative Project with funding shared by SGN and NGGT as a 60:40 split; SGN contributing 60% and NGGT 40% of the total cost.

Following additional costs affecting SGNs overall spend in October 2017, this funding split has since been revised to an 80:20 split; with SGN now contributing 80% of the overall project expenditure.

SGN

External Expenditure - £151,548

Total Expenditure - £201,924

NGGT

External Expenditure - £64,305.00

Internal Expenditure - £85,731.00

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)

Last year SGNs Southern Network Maintenance team carried out an exercise to review their <2bar operational routines and identified over 534 x pit sites that required regular pumping out; equating to just over £200k being spent every year on this activity. Therefore, basing calculations on the following network split of National Grid (NG) – 4, SGN – 2, Wales & West Utilities (WWU) – 1 & Northern Gas Networks (NGN) – 1 (with respect to the number of networks owned by each Network Licensee), it is assumed that total 'pumping out' costs for all 'affected' Network Licensee pit sites across GB, including any >2bar sites are likely to be in excess of £1m per year.

It is expected that if successful this Project could provide Network Licensees with an opportunity to make cost savings on any maintenance activities associated with managing flooded pit sites and as a direct consequence also allow cost savings to be made against their respective RIIO-GD1 allowances.

Although, it is unlikely every Network licensee would be able to, or possibly need to, remediate every affected pit within their networks, bearing in mind that a number of existing pit sites may already be targeted for full replacement due to other reasons besides flooding from pit wall water ingress, It is still expected that cost savings made through using this new technology should in turn provide net financial benefits to customers as a result of the improvements that are expected to be made to existing pit sites as a follow on from this Project.

Please provide a calculation of the expected benefits the Solution

For the purpose of the Cost Benefit Assessment (CBA) estimates have been based on the costs associated with the annual pumping out of 534 x pit DGs within SGNs Southern Network. The base cost breakdown below shows the allowance/costings per 534 x pit DGs, if all of the 534 x sites were to be fully remediated using the new technique by the end of RIIO-GD1.

Base Cost

Annual cost of current conventional 'pumping out' method - £200,000

Total Base Cost over 5yrs (2016 to 2021):
£1,000,000

New Method Cost

Estimated 'one off' cost of using new pit coating technique - £427,200

Total Savings

Total estimated savings for 534 x sites by 2021 £572,800

In comparison to the other Network Licensees, SGN are considered to own the largest volume of buried pit governors; however, all Network Licensees own buried assets installed within their respective networks. Therefore, assuming that the potential benefit across GB can be calculated using a 4:2:1:1 split amongst the GB GDNs, then the potential savings across GB could be in the region of £1m+ each year, once every affected pit site has been remediated using this new method.

Whilst this estimate provides an indication of potential applicability, it is important to note that it is also based on a number of 'unqualified' assumptions and is therefore subject to a large sensitivity margin. These figures are also based on averages and estimates, rather than real network data. Furthermore, the complexities associated with coating pit walls will vary from site to site, each site having a unique footprint which could be subject to an array of positive and/or negative influencing factors.

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

All Network Licensees own buried assets installed within their respective networks, which should make the Method fully replicable across the GB Gas Industry.

The Project is already of interest to NGGT, who experience similar pit water ingress issues to SGN, and NGGT have duly elected to join SGN in collaboration on this NIA Project. This collaboration also means that the Project will have the advantage of receiving input from both the Distribution and Transmission arms of the GB Gas Industry.

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

This information will be determined following the submission of the final report, because this element has been defined as one of the criteria to be achieved.

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

All Network Licensees will be able to use the learning from this Project as the outputs will be presented in a clearly defined report that will be available to them on request, this will allow the other Network Licensees to make informed choices as to whether they also want to invest in this technology.

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.

This project was developed from a market research activity to identify appropriate solution providers for the problem area and all Network Licensees were invited to participate in the market research appraisal, as well as collaborate on the project.

Two potential solutions have been proposed which the Project Partner states will provide a number of benefits over currently available technologies; namely:

· The provision of long-term protection against pit wall water ingress

· The deposition processes will be environmentally benign and will not pose any health hazard during application; no Volatile Organic Compounds (VOCs) will be formed during application

· The deployment systems will be easy to use, avoiding any need for specialist training

· The coating material will be able to carry out a ‘repair’ function to damaged pit walls when applied; thereby enhancing the structural integrity of the pit

· Other coating systems are primarily based on chemistries which have the potential to contaminate equipment within the pit, as well as nearby water courses, should they leach into the surrounding environment

· Unlike other coating systems, the proposed solutions will be designed for application on ‘wet walls’ that are also likely to be affected by fungal growth or biofilms; current coating systems generally require application to dry environments with smooth, exposed surfaces, so any existing ‘growths’ are likely to significantly impede the deposition of the protective layer

A review of other Network Licensee innovation portfolios has also been undertaken and there are no other projects aiming to provide a

solution to this particular problem area.

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