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

Mar 2014

Project Reference Number

NIA_SGN0022

Project Registration

Project Title

Small Pressure Pot

Project Reference Number

NIA_SGN0022

Project Licensee(s)

SGN

Project Start

October 2013

Project Duration

0 years and 7 months

Nominated Project Contact(s)

Ryan Smith, Innovation Delivery Manager

Project Budget

£6,986.00

Summary

The scope of this project is to design, trial and evaluate a new small pressure pot that has a capacity of 1.5 litre, is lightweight, easily portable, will reduce the injection process, and limit the amount of waste generated through material use and excavated material sent to landfill. If the small pressure pot proves to provide a more effective technique by which to seal joints, it will reduce the amount of joints requiring encapsulation and as a result the size of excavation and use of expensive external contractor resources.

Nominated Contact Email Address(es)

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Problem Being Solved

From the 1850's up until the 1950's cast iron mains were used extensively across the United Kingdom (UK) gas distribution network. Now the gas industry has moved away from this source of material and is using steel and polyethylene. However a significant portion of cast iron mains is still in use today. At present across Scotia Gas Networks (SGN) there are some 9,529 kilometres (km) of metallic mains <12" diameter that are ageing, requiring inspection, repair or replacement.

When installed, these sections of mains were connected at the joint by a bell and spigot. To seal the joints, jute - a plant fibre used in making burlap and twine was packed into the back of the joint, and molten lead was poured into the front of the jute packing creating a gas-tight seal. Over time, however due to ground movement, winter freeze-thaw cycles and the fact that jute is drying out causing it to shrink and/or crack, we are experiencing leaking joints.

Over the years many companies have looked to develop and market new products for the repair and maintenance of gas distribution networks. Currently SGN use a number of techniques including external anaerobic joint injection, internal main spraying or encapsulation to prevent leakage from joints. A brief description of each technique is listed below:

Internal mainspray – A single excavation is made on the main which a spray head and joint detection device are inserted through, the head is pushed up the main and once a joint has been detected anaerobic is sprayed to form a seal internally. This method can on

average cover 70 metres (m) of main from one excavation, but is only effective with low levels of leakage.

Joint encapsulation – This is the most expensive option which is often used if the other techniques listed have not been successful. It involves fully exposing around the joint and encapsulating it inside a prefabricated box to great a seal.

External joint injection - This is the most common technique out of the three, which requires excavation to expose the leaking joint which is then drilled to allow anaerobic to be injected in to the joint to the jute packing, re-establishes the seal. The injection is either performed using a hand pump or for larger diameters, a large pressure pot to inject anaerobic under pressure.

The mainspray solution we currently adopt is injected through a large diameter mainspray injection pot which allows anaerobic to be injected at pressure in to the joint, with a capacity of three litres, on all pipe sizes. From a recent review of the equipment it was apparent that there were two improvements that could be made:

1. The large weight of the injection pot, 24kg to be precise can cause concerns when transporting equipment.
2. The equipment has the potential to generate up to two litres of waste material; a method which if reduced would contribute to waste minimisation, in line with Network Licensees environmental objectives.
3. Due to the size and cost of the current equipment, it isn't viable to provide every team with one, resulting in additional trips taken to collect and transport the equipment to each site. A smaller device would allow its use more frequently, allowing the work force to become more efficient.

Method(s)

The specific design objectives are as follows:

1. Internal capacity of one litre of Mainspray material for application on mains 12" and below
2. Lightweight and Portable
3. Safe working pressure of 3 bar to allow the anaerobic to be injected under pressure in to the joint
4. A robust design with minimal maintenance required
5. The equipment will be focused on below 12" mains, but will be useable on larger joints if required.
6. The internal capacity of the pressure pot must be sufficient to allow one litre of Mainspray to be dispensed under pressure with the added benefit of not needing to clean the pot after each use.

It is inevitable that if this field trial proves to be a success, then the utilization of this technology could prove to be an efficient way for licensees to improve existing techniques and reduce both the size of excavation and the cost of materials required. Therefore aiming to improve customer experience, disruption and the time it takes Licensees to stop a metallic joint from leaking.

Scope

The scope of this project is to design, trial and evaluate a new small pressure pot that has a capacity of one litre, is lightweight, easily portable, will reduce the amount of mainspray used, and limit the amount of waste generated through material use and excavated material sent to landfill. If the small pressure pot proves to provide a better seal than the current techniques, it will reduce the amount of joints requiring encapsulation and as a result the size of excavation and use of expensive external contractor resources.

Objective(s)

This purpose of this project is to design a small lightweight pressure pot to be used in conjunction with the existing ALH Large Diameter Mainspray Injection Equipment.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

In order to determine whether this project has been successful the following key milestones will be achieved:

- Off site testing review and product verification of the prototype using specially designed test rigs with the results submitted to SGN for approval.
- Upon approval, the equipment will be field trialled across three of our network locations in Scotland, South and South East.
- Full product evaluation will be carried out to determine how this new product compares to existing techniques and whether it will provide us with the most cost effective solution for sealing joints.
- A practical demonstration for all GDN's to observe the new equipment in operation.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

In order to ensure that learning associated with this project is maximised and that the future application of this technology is well understood, a sufficient off site testing review and product verification of the prototype will be carried out, followed by field trial of this new equipment across three of our networks in Scotland, South and South East England to ensure the equipment is used in a representative range of environments.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

This project will be trialed in three depot locations, one in each of SGN's regional networks; Scotland, South and South East England.

Revenue Allowed for the RIIO Settlement

SGN's RIIO-GD1 Allowance for Repair activities are £209.6m. While no direct savings are expected during the project implementation period, it is likely that some of this expenditure can be saved if this project confirms the expected benefits of the Small Pressure Pot equipment.

Indicative Total NIA Project Expenditure

The total project expenditure will be £6,986, 90% of which is allowable NIA expenditure (£6,287)

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)

For mains diameters between 4" and 12" SGN carried out 9665 joint repairs in 2012. In the worst case scenarios, SGN encapsulated 128 of these joints. The average cost of sealing the joint using a specialist contractor would have incurred £2900 of costs covering materials, excavation, labor and the use of the external contractors.

The cost of sealing a joint using conventional anaerobic sealants, which SGN carried out on the remaining 9537, has an average cost of £1500.

In some scenarios it will be inevitable that joints will have to be encapsulated due to the nature of their configuration or specific site conditions. The intention of the new pressure pot is to reduce the quantity requiring this type of work, and when the new techniques can be applied a reduction in the size of excavation and the associated labor costs. A combination of all of these factors will reduce the overall cost to the network by an estimated figure of 5%.

This equipment has been designed to be used across a large variety of mains sizes covering both LP and MP mains. As a result it is difficult to ascertain an accurate figure on the savings made possible by the introduction of the new equipment prior to the products development and field trial.

Please provide a calculation of the expected benefits the Solution

Using the figures stated above, the cost savings will result in

£1500-£1425 = £75 (Benefit Estimation for Development) per gas escape where anaerobic sealant would currently be used. This would result in an estimated total saving of £715,275 per annum.

It is anticipated the quantity of joints requiring encapsulation would also reduce by 25%, bringing the average cost down from £2900 to £1425, with a cost saving of £1475 per repair. Using the 2012 figures, this would result in a reduction in encapsulated joints for SGN by 32, with a total saving of £47,200.

Using the calculations above, the total savings for SGN would be:

£715, 275 + £47,200 = £762,400 per annum.

Once the product has been trialed, an accurate cost analysis will be carried out using the field trial findings.

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

Based on the quantity of sites at which SGN expect to be able to use this technology, and a 4:2:1:1 split with reference to the size of each network, it is assumed that National Grid have approximately 19,330 sites, and Wales & West and Northern Gas have 4832, gives an estimated total of 38,659 sites across Great Britain (GB) where this technology could be applied.

It must be noted that these figures are based on averages and estimates rather than real network data and the complexity will vary from site to site. The main focus of this project is to test the technology and understand the potential benefits.

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

Excluding the cost of purchasing the equipment, it is anticipated that the cost of disseminating the development outcomes and findings from the project and training costs incurred before the product can be used would be approximately £10,000 for SGN. Using the 4:2:1:1 split with reference to the size of the networks, It could be assumed that National Grids training costs would be approximately £20,000, and Wales & West Utilities and Northern Gas Networks would be £5,000 each. Therefore, the estimated total cost of training before the equipment can be used operationally would be £40,000.

This figure includes three training courses for 12 people for each Network Licensee in three separate locations across their network with an allowance for travel included, plus approximate costs for one practical demonstration of the equipment by SGN for representatives from each Network. It is anticipated that each Licensee would have their internal training carried after an initial training program from the product manufacture to a selective proportion of their workforce.

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 results from the field trials and comparisons that are made against existing techniques will be shared with the other Network Licenses. If proven to be a success this will allow network licenses the opportunity to improve existing techniques, reduce both the size of excavation and the cost of materials required.

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