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NIA Project Registration and PEA Document

Date of Submission

May 2016

Project Reference Number

NIA_SGN0093

Project Registration

Project Title

Small Diameter PE Flowstop

Project Reference Number

NIA_SGN0093

Project Licensee(s)

SGN

Project Start

May 2016

Project Duration

4 years and 7 months

Nominated Project Contact(s)

Alex Stewart, Innovation Project Manager

Project Budget

£320,000.00

Summary

This project will involve work alongside WASK / Crane Ltd to carry out design, development and testing of a new electrofusion bag saddle, to current Gas Industry Standard GIS/PL2 (Parts 1,4,5 &6), to expand the range of the existing process down to 90mm PE. It will look to verify its suitability as an alternative system to conventional squeeze off on small diameter PE mains. The outcomes of the project will be:

1. Full development, offsite and onsite testing of an electrofusion saddle to GIS/PL2 (Parts 1, 4, 5 & 6) in the range 90mm-250mm PE.
2. Design and development of an electrofusion clamping system for use with the new saddle design for use in 600mm core excavations.
3. Design and development of the drilling system and closure plug for use on the newly designed bag off saddles.
4. Development of flow stopping equipment for use in the new design of bag off saddle, including bypass equipment.
5. Pre-trial testing to prove compliance with GIS/PL2 (Parts 1, 4, 5 & 6) and production of relevant Work Instructions
6. Off Site Field trials and any required amendments to Work Instructions
7. Live field trials and any required amendments to Work Instruction

Nominated Contact Email Address(es)

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Problem Being Solved

Since the introduction of Polyethylene (PE) mains in the early 1980's as a replacement for metallic mains systems, the main way to

stop the flow of gas to abandon, connect or maintain these pipes has been to squeeze the pipe closed. This method is known as “squeeze off”.

The previous PE Asset Life Project (NIA_SGN0004) identified some issues with the use of squeeze off as a main flow stop method. The project identified issues with sections of PE pipe which had been “squeezed off”, potentially reducing the expected life of the asset by up to 20%. Although there is an alternative bag off solution for larger diameter PE mains, no alternative currently exists for mains sizes up to 250mm (Tier 1).

Method(s)

Currently there is no alternative for small diameter pipes as PE bag off and fittings are only available from 250mm PE upwards. This project would extend that range down to 90mm PE in order to maximise the associated benefits and minimise the need to carry out PE squeeze offs. The provision of the extended range and newly designed fittings would also enable the use of equipment previously developed under the Core Drilling and Flow Stop (NIA_SGN0052) and Water Extraction Reel and I Branch (NIA_SG0027) projects, to be used on PE mains. The fittings would be designed to allow them to be fitted and used in a 600mm core excavation or very small conventional excavation, thereby reducing the amount of imported virgin reinstatement materials and the impact of our works on members of the public by reduction of traffic disruption and reduction in overall job time.

Scope

This project will involve work alongside WASK / Crane Ltd to carry out design, development and testing of a new electrofusion bag saddle, to current Gas Industry Standard GIS/PL2 (Parts 1,4,5 &6), to expand the range of the existing process down to 90mm PE. It will look to verify its suitability as an alternative system to conventional squeeze off on small diameter PE mains. The outcomes of the project will be:

1. Full development, offsite and onsite testing of an electrofusion saddle to GIS/PL2 (Parts 1, 4, 5 & 6) in the range 90mm-250mm PE.
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Objective(s)

The objectives of the project are to:

- Produce and test equipment to carry out PE flowstopping on Tier 1 assets and prove compliance with GIS/PL2 and that the equipment is suitable for use in a 600mm core excavation.
- Provide report detailing test results to allow field trial documentation to be produced.
- Completion of full suite of field trials to be carried out on a range of diameters in both conventional and core excavations to prove the equipment to carry out PE flowstopping can be of benefit in a ‘live gas’ scenario.
- Completion of final project report.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The success criteria for the project are to evaluate and test the new small diameter bag off equipment against conventional flowstop techniques and compare the performance in terms of:

- Evaluate the suitability of the equipment as a replacement for conventional flowstop methods
- Confirm compliance with GIS/PL2 (Parts 1,4,5 & 6) for use of equipment in extended size range
- Demonstrate the effectiveness of small diameter PE bag off as a permanent replacement for conventional squeeze off in both conventional and core excavations and across the extended size range.
- Evaluate performance versus conventional techniques detailing benefits of the new technique versus conventional.
- Produce acceptable detailed final report including test results showing compliance with standards and field trial results showing detailed potential savings.
- Disseminate information and project outcomes

Project Partners and External Funding

Project Partner – Crane Ltd

Potential for New Learning

Following on from the previous research this project will provide all Network Licensees with an understanding as to the suitability and limitations of using small diameter PE bag off as a replacement for conventional squeeze off techniques on Network Mains. The project will focus on extending the existing size range of available fittings down from 250mm to 90mm PE and also minimizing the size of excavation required, ideally being able to carry out the operation in a 600mm core excavation.

The project outcome is expected to provide a new method of flowstopping small diameter PE mains and provide Network Licensees with a more cost effective solution compared with conventional techniques. The project will also provide test information on the new equipment to ensure it is compliant with current Industry Standard GIS/PL2.

SGN aims to disseminate the learning from this project via a technical report and practical demonstration if required.

Scale of Project

The project will concentrate on extending the existing range of PE bag off saddles and equipment down from 250mm to 90mm. This would minimise the use of squeeze off on these mains as the main flowstop technique which has been proven to reduce the expected life of the main by up to 20%.

The Project will develop the fittings and tooling to allow its use in 600mm core excavations as well as very small conventional excavations. In doing so this will reduce the inconvenience to road users and members of the public and tie in with SGN's small excavation strategy.

There will be a number of field trials completed over the full range of sizes using the equipment in both Scotland and Southern Networks to prove it's fitness for purpose. These field trials will also be carried out in both conventional and core excavations.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

The project will be predominantly completed at Crane's offices in Hitchin, however, a number of field tests will be required. These field tests will be completed in Scotland, South and Southern East England.

Revenue Allowed for the RIIO Settlement

During RIIO-GD1 it is estimated that OFGEMs proposed allowance for 2013-21 Replacement Tier 1-3 activities for all Network Licensees is approximately £5,195.2m. While no direct saving on this is expected during the project, it is anticipated that, if successful, the output from the project could provide significant financial and time savings over conventional processes, as well as removing the issue with reduction of the life expectancy of PE within the Networks.

Indicative Total NIA Project Expenditure

The total project expenditure is £320,000, 90% of which is allowable NIA expenditure (£288,000).

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)

Conventional flow stop techniques on small diameter PE mains (less than 250mm PE) are usually carried out either by using valves or, more commonly, by using a squeeze off to tightly flatten the pipe. This technique has been in common use since the introduction of PE main into the GB gas Network in the early 1980s.

A recent Project which looked at the potential life expectancy of PE mains identified that use of the technique contributed to a reduction in the expected life of the PE by up to 20%.

Squeeze offs also require additional fittings and extended excavations to provide a complete seal and meet the current requirements when applying squeeze offs next to fittings.

On a 90mm main the standard squeeze off excavation needs to be approx. 2 metres in length. In order to minimise the need for such a large excavation the new branch saddles and equipment will provide the option of installing a twin bag operation through a single opening with the possibility of this being carried out in a 600mm diameter core excavation.

Due to the extended range of diameters being considered by this projects (90mm-250mm) the size of the conventional excavations required would vary. This is also very dependent on the existing ground conditions, surface type and mains layout.

On the presumption that the project proves an effective alternative to squeeze off up to 250mm PE pipe diameter it is anticipated the estimated average costs saving per job would be around £267.

Please provide a calculation of the expected benefits the Solution

On the basis of the presumptions made above and if the project were to successfully prove these as correct it is anticipated that with SGNs Networks the repair would be used on average 1,000 per year.

On this basis and taking into account the anticipated average savings mentioned above:

- Base cost for average excavation on size range = £520
- Estimated average cost using new technique due to reduced excavation size= £253
- Annual savings – 1000 repairs x £267 saving per repair = £267,000 per year

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

Taking the figures mentioned above as an estimate on SGN figures and taking account of the potential estimated savings calculated.

Based on a 4:2:1:1 split with reference to the size of the networks, it could be assumed that National Grid may have approximately 2,000 similar repairs Wales&West Utilities and Northern Gas Network share around 500 each. Therefore the estimated number using the alternative bag off flowstop technique across GB would be 4,000 per year.

On the basis of the anticipated £267 per joint saving this equates to approximately £1,068,000 of anticipated savings per annum.

While this estimate provides an indication of potential savings, it is important to note that it is necessarily based on a number of unqualified assumptions and therefore subject to a large sensitivity margin.

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

As the number of potential jobs the alternative flowstop technique could be used for across GB is unknown, it is difficult to determine the exact roll out costs. Also until completion of design and testing it is unknown what the final equipment and fittings costs would be. It is anticipated that the cost of disseminating the learning outcomes and findings from the Project would be approximately £45,000 for SGN (including training costs). Based on the 4:2:1:1 split (applied with reference to the size of each network) it is estimated that the total cost of training before the technique could be used operationally throughout GB would be £180,000. This estimate is based on an assumption of training courses and operatives per Network Licensee, provided by the project partner and is subject to change.

SGN will continue to share Project progress throughout the duration of the Project with the other Network licensees.

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 learning could be used to allow Networks additional, more efficient and cost effective, options when carrying out flowstopping on small diameter PE mains. The outcome from the previous project proved that existing squeeze off techniques had a detrimental effect on the life of PE mains. This project, if successful, could potentially extend the scope of PE bag off technique across a wider spectrum of mains thereby removing the issues identified with squeeze off locations. The project will also attempt to provide evidence of the suitability of the technique for use in core excavations or very small conventional excavations.

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 aims to expand the use of PE bag off as the primary flow stopping technique used on our Network. This change will reduce the impact on Asset life and integrity when using conventional squeeze off techniques which deform the pipe wall to stop the flow of gas. Although PE bag off is currently available the size range is limited to 250mm and above and, therefore, the bulk of the existing mains replacement size range is excluded.

Introduction of these new fittings and equipment will allow expansion of the use of PE bag off to all sizes 90mm and above. The project also aims to design and develop the equipment to be used in very small conventional excavations or 600mm core excavations therefore making the operations much safer for both our Operatives and members of the public both in the size and duration the excavations need to remain open. There is also the added advantage that the fittings, once installed, can be reused so several flowstop operations can be carried out at a single location rather than extending the excavation or cutting out the section of pipe which was squeezed off. This means a reduction in the size of excavation and, potentially, a reduction in waste PE. Since the operation can be carried out more quickly and with less waste this could, if the project is successful, improve performance when carrying out flow stop operations on small diameter PE mains.

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.

A review of all other Network Licensees' NIA reports have been undertaken and no similar projects have been identified.

A similar review of current academic literature and journals has also been performed to avoid any potential overlap with the project.

The supplier has provided clarity that no unnecessary duplication of this project is currently being undertaken in the UK.

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