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NIA Project Registration and PEA Document

Date of Submission

Mar 2021

Project Reference Number

NIA_NGN_295

Project Registration

Project Title

Bonded Saddle V2

Project Reference Number

NIA_NGN_295

Project Licensee(s)

Northern Gas Networks

Project Start

March 2021

Project Duration

1 year and 1 month

Nominated Project Contact(s)

Ben Gill

Project Budget

£259,150.00

Summary

This project is to further develop the ALH bonded saddle to allow it to be used for flow-stopping and STASS robot mains entry as well as challenging the current D/4 drilling regulations.

Northern Gas Networks (NGN) have fully implemented the use of Bond and Bolt saddles as part of the STASS operation, which is attached to the metallic main using a resin based adhesive and bolts.

The technology allows a number of benefits including increased safety to operatives and general public and cost savings on excavation and reinstatement

The D/4 drilling regulations mean that NGN are only allowed to drill a hole $\frac{1}{4}$ the size of a main to gain access (a 5 mm hole in a 20 mm pipe for example) as the current train of thought is that anything bigger will undermine the stability of the main. There is no substantial evidence available to accurately dispel this legacy regulation and as such an investigation and findings need to take place (as a part of this project) to ensure we can change regulation safely.

One limitation of the current method, Bond and Bolt, is that the resin used requires a 24-hour cure before any ALH System 3 drilling operations can take place. The resin utilised in the new technique, Bonded Saddle, only requires a 90-minute cure time prior to drilling, albeit the drilling uses an ALH System 1 drill rather than a System 3.

The D/4 challenge is that we are unable to access some mains with our robotic technology due to not being able to drill a hole big enough to launch the robot. A specific example here is that STASS requires a 6" drilling to launch the robot, therefore for any main less than 24" diameter we are required to excavate fully around the main and install and encirclement clamp to facilitate drilling. A key example here is that 18" mains is the primary work basket for STASS and is the largest volume of repairs undertaken on Tier 3 pipes.

Nominated Contact Email Address(es)

innovation@northerngas.co.uk

Problem Being Solved

Current techniques to access Tier 2 and 3 assets, typically 14" and above require full 'wrap around' chains to enable drilling equipment to be safely secured. To do this requires fully excavating around the host asset increasing the safety concerns related to excavation in addition to the costs of the aforementioned excavation, (including ground and pipe support), and subsequent backfilling, both financially and environmentally.

Additional tangible disadvantages to large excavation can be identified as the disruption to road users and general public which are extended due to additional time spent on site.

Method(s)

In 2014, ALH Systems developed the 'Bond and Bolt' system that requires only the crown of the host pipe to be excavated. Whilst this has clearly defined benefits in reducing the need for excavation and improvements to safety, the process to install a saddle takes a little over 24 hours to install as the resin technology used in the process, requires a full 24-hour cure period.

Bond and Bolt was developed to enable operations to drill 3" – 6" openings for camera surveys, flow stopping and STASS robotic surveys. Following on from Bond and Bolt, this evolved in to the 'Bonded Saddle' which is designed to enable access up to a 2" opening but the resin technology developed further to enable a 90-minute cure.

It is proposed that further development of the resin technology of the Bonded Saddle can be innovated further to be used on the Bond and Bolt saddles. This will enable the same access capabilities, but with a significant decrease in time required onsite to carry out operations such as STASS and flow stopping. Traditionally, using Bond and Bolt requires mechanical bolting to the host main to further support the adhesive, however developments and advancement of resin technology now enables the opportunity to speed up the curing process whilst also enhancing the resin capabilities.

Scope

Stage 1 - Completion of Resin testing

- Clearly defined project scope with anticipated project outputs
- Calculations of resin and mechanical requirements clearly documented in accordance with the outputs from the FMEA event
- ALH In-House report on initial findings issued to and approved in principle by Rosen

Stage 2 - Completion of mechanical development

- Non-Tap Plug installation completed with extended NTP carrier ready for trial
- All saddles for CI/ SI and Steel drawn up and ready for manufacture
- Necessary drafted work procedures updated for review

Stage 3 - Rosen Testing

- Support initial FMEA
- 8 off saddles (4 at 18" Cast Iron, 2 at 48" Steel and at 48" Cast Iron) delivered to Rosen for testing. As part of testing, the saddle provided may utilise existing bond and bolt saddles, ie will carry 5 off holes. The reduction in surface area for the adhesion is perceived to be minimal however these can be blocked up where necessary
- Supply of Field Engineer support for testing
- Support Rosen with test report close out

Stage 4 - Completion and Validation

- All agreed number of field trial completed – perceived requirements.

Objective(s)

The objectives of the project are:

- Development of a suite of technical reports to support the in-house manufacturer testing of the resin
- Carry out physical tests at 3rd party partner to validate in house testing and therefore offer assurance for network approval
- Carry out live, G23 Field Trials to confirm anticipated reduction in time taken to carry out operations are proven and thereby validate

the Cost Benefit Analysis

- Clearly identify the cost savings against traditional alternatives for using Bonded Saddle technology
- Utilise existing saddles to remove the need for additional tooling

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project will be deemed a success if the following is achieved:

- Successful laboratory testing
- Successful independent testing and validation by a 3rd party
- Successful network trials in the field to validate the suitability
- Evidence delivered to enable approval to implement into Business as Usual (BAU)

Project Partners and External Funding

Northern Gas Networks

Rosen

ALH - who are contributing £20,650

Potential for New Learning

The methodology of utilising bonded technology for a broader range of operations and drilling diameter with the adhesive not requiring mechanical sealing and thereby significantly reducing the cure time.

Scale of Project

The scale of the project covers the following four areas.

- Resin Testing – to ensure the resin can hold the appropriate weight
- Mechanical Development – to ensure the saddles are mechanically sound
- Rosen Testing – independent third-party testing to gain accreditation
- Validation - Field trials to prove technique works

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

This project will take place within the Northern Gas Networks network geography.

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

External Cost = £190,800

Internal Cost = £47,700

Total Cost = £238,500

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)

Initial CBA forecast indicates the potential for up to £500k p.a. of overall cost benefit.

Please provide a calculation of the expected benefits the Solution

Analysis indicates that there is a substantial cost benefit for this operation based largely around time on site to perform operations, reinstatement costs and includes hire of traffic management and delays / impact to customers.

The benefit derived from these are assumed at c.£12k per week. and incorporate the following:

- Reduce cure time for saddles from 24 hours to 3 meaning same day operation as saddle fit, thus increasing efficiency and outputs STASS team.
- Increased ability to incorporate 18" mains into bonded robotics operations.
- Less time on site, thus reducing impact to general public and subsequently reducing stakeholder impacts

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

The emergency and replacement programmes / service are applicable to all GDN's, therefore this project is applicable to all gas networks. Roll out costs are subjective and relevant to network deployment appetite.

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

The implementation cost post-completion of the project will be assessed and will be defined depending on the project outputs. The output of the project is expected to be a high TRL solution which is will be commercially available for all networks to enable completion of network activity.

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 solution developed by this project is relevant to all networks as it directly relates to the tasks undertaken in flow-stopping, robotics repairs and drilling of live gas mains.

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

The project links directly to emergency and repair works as well as distribution mains replacement, reliability and maintenance and therefore addresses the 'Optimised assets and practices' element of the GNIS.

- 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 has been made of all the SNP and all other Network Licensees and no other similar projects have been carried out.

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

The project is to use, and further innovate, existing techniques on a broader range of operations that until now it has not been proven on. In addition, a review and challenge of the D/4 criteria for drilling, thus enabling more jobs to be done via Robotics to minimize impact on general public.

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

No solution exists to resolve this matter, and this is significant development and an uncertain high-risk approach not covered by current regulatory arrangements as part of BAU.

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

This project presents specific challenges to technical and operational measures and the mechanics of assessing services pipes in a gas free environment without impacting supply are very much uncertain and a risk. The commercial factors surrounding this approach are also uncertain. The solution may prove to be technically feasible but the commercial arrangements to enable deployment must be considered and proven throughout development and demonstration. For these reasons it is appropriate that NIA funding is utilised.

This project has been approved by a senior member of staff

Yes