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NIA Project Registration and PEA Document

Date of Submission

Mar 2023

Project Reference Number

NIA2_SGN0036

Project Registration

Project Title

BISEP - H2 Testing with LTS Futures (Phase 1)

Project Reference Number

NIA2_SGN0036

Project Licensee(s)

SGN

Project Start

March 2023

Project Duration

0 years and 7 months

Nominated Project Contact(s)

James Heywood

Project Budget

£176,773.00

Summary

Flow-stop tooling is regularly used for major projects and emergency works across the LTS and NTS gas networks. A pipe loop is being constructed in Spadeadam to assess the suitability of materials, procedures, and equipment with 100% hydrogen gas streams. The opportunity has presented itself to integrate testing (at Spadeadam) on the BISEP® tool delivering technical assurance prior to Grantham to Grangemouth live field trial on the LTS Future project. When successfully completed, a proven double block and bleed leak tight line stopping technology suitable for 100% hydrogen will be available to the UK Gas Networks and the earning gained from this project can be applied to Network Licensees and their operations to facilitate a safe transition to hydrogen from natural gas.

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

The purpose of the overall SGN LTS Futures project being undertaken by SGN with funding from Ofgem is to provide the critical evidence required to convert the LTS to 100% hydrogen. The LTS is made up of 11,000 km of high-pressure pipelines delivering gas from National Transmission System (NTS) offtakes to towns and cities across the country. The project will provide critical insight into any identified issues and illustrate solutions for the commissioning or conversion to 100% hydrogen for the gas transmission network. Specific flow stop tooling is used regularly for major project and emergency works which will need to be assessed for its suitability for operations within 100% Hydrogen. As hydrogen can be more volatile than natural gas it will be more critical to have a leak tight line stopping technology available.

STATS BISEP® offers an industry leading technology solution for temporary line plugging. Achieved using patented and DNV Type Approved technology, the BISEP® provides a fail-safe double block and bleed isolation deployed through a single full bore hot tap, without the need for additional hot tapped bleed or vent points. The BISEP® offers significant safety advantages over traditional line stop technologies, with the hydraulically activated dual seals providing leak-tight isolation of live, pressurised pipelines.

This high integrity isolation is provided by a spherical dual seal plug which is hydraulically deployed into the pipeline from a pressure competent launcher, through a dual seal isolation valve. The seals are hydraulically compressed resulting in radial expansion against the pipe bore. During isolation barrier proving, each seal is tested independently with full pipeline pressure in the direction of the expected pressure differential, proving both seals of the double block isolation are leak tight. Following successful seal proving, the vented annulus void is then closed and monitored confirming isolation integrity throughout the isolation period.

Method(s)

Phase 1:

A representative offline function test of the 18" BISEP® (horizontal orientation) will be performed at STATS HQ. The BISEP® test will consist of:

- Deploying and hydraulically activating the BISEP® in 100% inert gas.

- 26barg differential pressure will be applied.

- The BISEP® seals will be individually leak tested as per the usual BISEP® seal testing process.

- Coordinate with Innovation project team on matters arising from FPSA/HAZID/HAZOP

- Complete Factory Acceptance Testing observations:

 - ITP and conformance / test certificates

 - Vendor design documentation

 - Roles and responsibilities

 - Vendor operating instructions and functional test requirements

 - Calibration certification

 - Pre/post surface inspection reports to identify any pipe wall damage during functional testing

 - Review pre / post inspection results (internal and external surface)

 - Sealing capability

 - Onsite checklist before commencement of field deployment

Phase 2:

At Spadeadam, the testing and analysis will provide insight by:

- Testing with 100% Hydrogen of 1 x 18" BISEP® - this is a horizontal (parallel to ground) deployment

- Field deployment observations

- Witness single field deployment, observations, and report findings

- In advance of Online Deployment:

 - Incorporate lessons learnt from Offline Trial

 - Apply onsite checklist for Online Deployment

 - Complete system checks

 - Issue Online Deployment log, to record all activities and observations

 - Commission and test tracking system

 - During Online Deployment, complete field deployment log

After Online Deployment, post-deployment review report, recommending future use of technology and procedure requirements

Scope

The ongoing LTS Futures program of work (Element 3; Offsite Testing, Work Pack 1) includes hot tapping activities to be carried out in a flow loop rig at Spadeadam Research and Development facility which provides an opportunity to carry out the BISEP® deployment trial through one of the tees that will be installed. The loop rig at Spadeadam is installed above ground and will contain a section of 18" NB X52 pipe (spiral seam weld, 6.35 mm wall thickness) to which one grouted tee and two 18"x18" split welded tees will be installed under 100% hydrogen flowing conditions at a maximum flow of 7m/s. The working pressure of the rig is 20 barg. The BISEP® line stopping tool will be deployed through the 18"x18" split tee which will be installed with horizontal offtake, with the centreline of the offtake being at 0.5 m above ground level. It is assumed the drilling and BISEP® tools have enough ground clearance therefore no digging efforts have been added to this scope.

The major advantage of undertaking the work at this time is that tee welding/hot tapping is already planned to be proven on the LTS Futures field trial being delivered. The addition of a BISEP® deployment is very small supplementary and complementary work, providing additional deliverables to the overall project scope. When successfully completed, a proven double block and bleed leak tight flow stopping technology will be available to the networks, which is an improvement on the technology largely currently in use by the networks, which is not leak tight.

Objective(s)

The objective is to demonstrate the operation and deployment of a BISEP® flow stopping tool, proving that the tool works to a satisfactory level as deemed by SGN. Therefore, and thereafter having a high integrity line stopping technology approved for use in 100% hydrogen. Following the completion of this project, sufficient evidence will have been collected to safely trial the BISEP tool on the LTS Futures live field trial.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

A successful trial at Spadeadam will provide an additional piece of evidence to support the role out of hydrogen as a form of energy distribution. The outcomes of the project will not adversely affect vulnerable customers but feeds into a wider piece of work to decarbonise the gas network. The BISEP® offers significant safety advantages over traditional line stop technologies, with the hydraulically activated dual seals providing leak-tight isolation of live, pressurised pipelines. Other projects will explore how vulnerable customers will not be left behind on this journey.

Success Criteria

Achieve a satisfactory test with the BISEP® flow stopping tool, such that SGN/nominated representatives are satisfied with the performance of the BISEP® and it is deemed safe to work downstream of the isolation, with STATS technicians in control of the pressure.

Project Partners and External Funding

STATS UK Ltd
Pipeline Integrity Engineers Ltd
GL Industrial Services UK LTD trading as DNV

Potential for New Learning

The project will provide unique and referenceable information for Network licensees and industry on flow-stopping tooling on transmission pipelines with 100% hydrogen. The learning gained from the project can be applied to Network Licensees and their network operations to facilitate safe transition to hydrogen from natural gas.

Scale of Project

Flow stopping technology is required for pipeline diversions, repairs and to isolate defective valves so they can be safely repaired or replaced, crucially without disrupting supply to customers. The BISEP® tool can be used on any of these scopes. It is also enabling scopes that cannot be completed with the existing technology on the market as it can be deployed on sloped pipe, or parallel to ground as well as it can fit into tight spaces.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL6 Large Scale

Geographical Area

Phase 1 of the project will take place at STATS HQ, Kintore, Aberdeen.

Phase 2 will take place at Spadeadam.

Revenue Allowed for the RIIO Settlement

NA

Indicative Total NIA Project Expenditure

SGN External - £159,096

SGN Internal - £26,516

Total - £176,773

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:

Once complete a flow stopping technology (BISEP®) will be available for use in Hydrogen pipelines, this technology is essential for work to be conducted on pipelines without having to shut them down.

Cost benefit analysis exercises were completed by NGN and Wales and West in 2021 for the use of the BISEP® verses other transmission rated flow stopping technology and it was found to offer overall savings, this is because less fittings and materials, welding, inspection, excavation and therefore time are required to undertake a BISEP® project. It also limits the risk in terms of intervention onto a live pipeline.

How the Project has potential to benefit consumer in vulnerable situations:

Hydrogen is more volatile than natural gas, the current technology used on the networks is not leak tight, gas is planned to be discharged and is discharged during work scopes, this includes in built up areas. The new technology will significantly reduce these discharges, meaning it is a much safer option.

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)

Not Applicable

Please provide a calculation of the expected benefits the Solution

Not Applicable

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

On any pipeline flow stopping project, where the stopple would usually be used, the BISEP® can be used. And the BISEP® can be used in many locations where other transmission rated flow stopping technology cannot. This is typically either within an AGI, midline or in a built-up area. Typically for pipeline sectional replacements, valve changeouts or pipeline diversions.

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

Costing for this type of activity is defined on a project-by-project basis. This is because variables including pipe diameter, pressure, site accessibility and a multitude of other factors determine the overall cost of each project.

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 project will provide unique and referenceable information for Network licensees and Industry on flow-stopping tooling on transmission pipelines with 100% hydrogen. The learning gained from the project can be applied to Network Licensees and their network operations to facilitate safe transition to hydrogen from natural gas. The final project report is expected in December 2023

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

Not Applicable

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 will build on previous work in this area and has been discussed with the other networks to ensure there is no duplication of work. The findings from the project will be shared with all key stakeholders.

If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

Not Applicable

Additional Governance And Document Upload

Please identify why the project is innovative and has not been tried before

The project will provide critical insight into any identified issues and illustrate solutions for the commissioning or conversion to 100% hydrogen for the gas transmission network. Specific flow-stop tooling is used regularly for major project and emergency works which will need to be assessed for its suitability within 100% Hydrogen.

Relevant Foreground IPR

Background IPR: Trial Procedure and Operating (OPS) Procedure

Foreground IPR: Technical Report sharing operational performance and learnings within 100% Hydrogen environment.

Data Access Details

Any consumer data gathered throughout this project will be anonymised and will be compliant with General Data Protection Regulations (GDPR) and the UK Data Protection Act. Any compliant data can be made available for review upon request

Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

This project isn't being funded as business as usual because it is deemed an essential part of the 100% hydrogen trials process which is a key step towards conversion of the existing gas network to 100% hydrogen.

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

The conversion of the GB gas network to 100% hydrogen is key on the road towards net zero. A reliable supply and the assurance of safe operations for workers and the public are crucial to support the viability of the hydrogen transition. The NIA framework can support works that ensure results that play an essential part in the roll-out of hydrogen.

This project has been approved by a senior member of staff

Yes