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

Jun 2023

Project Reference Number

NIA2_SGN0038

Project Registration

Project Title

Stopple Testing to 100% Hydrogen

Project Reference Number

NIA2_SGN0038

Project Licensee(s)

SGN

Project Start

June 2023

Project Duration

0 years and 4 months

Nominated Project Contact(s)

James Heywood / Ashley Burnhop

Project Budget

£311,866.00

Summary

This project will utilise the test loop funded and constructed under the LTS Futures funding to deliver additional evidence and justification that decarbonisation of the Location Transmission Network (LTS) is feasible. The project will provide critical insight into the current industry standard flow stop tooling for use on major project and emergency works which will ultimately need to be assessed for its suitability for operations within 100% Hydrogen.

Third Party Collaborators

Pipeline Integrity Engineers Ltd

DNV

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

In the event maintenance work is required on the gas network, a number of tools and techniques can be used to temporarily stop the flow of gas, which allows the gas to continue to flow whilst work is carried out. Crucially, the flow of gas must be stopped in a specific area of the pipe run without disrupting the gas supply in the whole of the pipeline. One of the ways this can be done today is using stopple equipment, which involves drilling into the gas main, installing a valve and inserting a stopple to stop the flow of gas. Ahead of any transition to hydrogen we must test current equipment to understand how it behaves in a hydrogen environment, and establish what changes, if any, are required to allow these types of operations to continue in a hydrogen pipeline.

Method(s)

This project proposes the testing of an 18” under pressure drilling and stopple operation on a hydrogen test rig. Below is a high-level

method statement for the trial.

Before starting work – atmosphere checks must be undertaken. An extensive pre-check of all stopple equipment should be carried out to ensure that the equipment is suitable to withstand the line pressure and temperature to which it will be subjected and is otherwise fit for purpose.

Under pressure drilling (preparation) – select suitable full-bore valve and cutter for drilling operation. The bore of the valve is to be checked for trueness and to be free of any obstructions. Select drilling machine adapter to suit tapping valve flange series and ensure flange joints are aligned correctly. Mount the drilling machine and adapter on the closed tapping valve. Re-open tapping valve and introduce nitrogen through the drilling machine valve until the pressure is equal to line pressure and confirm that assembly is free from leaks. Close tapping valve and blow down section on the machine side of the valve through the drilling machine vent valve. This will confirm that the valve seals are satisfactory. Extend boring bar until the pilot drill touches the pipe. Confirm on the machine measuring rod or rev counter that the correct distance has been travelled.

Stoppling (preparation) – the fittings will be set out and sized. Williamson sandwich valves only will be used on stopple fittings to ensure accurate alignment and sufficient bore clearance for stopple cutters, stopple plugging head and L.O.R plugs. Under pressure drilling will be carried out and coupons retained as required for replacement in the completion stage.

Completion (preparation) – Williamson drilling machines are used to set completion plugs to permit recovery of all the tapping valves. After plug has been attached to the plug holder and drilling machine boring bar, retract the plug into the drilling machine adapter until plug stops. Take measurements and record plug setting distance. Mount drilling machine and adapter on to the closed valve and tighten joint bolts ensuring correct alignment of flanges.

Under pressure drilling (operation) – Lower upstream plugging head into position, vent down pipe section between stopples to atmosphere. Insert nitrogen-inflated bags between the stopples to determine if the stopple seals are acceptable. Once operational seals have been obtained the section between the bags will be purged to nitrogen until a safe atmosphere exists. Purge section of gas between the stopples and equalise pressures across the stopples. Retract upstream stopple first followed by downstream stopple. Close sandwich valves, vent down stopple housings and remove stopple units from valves.

Following the stopple operation, equipment will be stripped down and examined. This will determine the affect of hydrogen on the sealing elements.

Scope

A pipe loop is being constructed in Spadeadam to assess the suitability of materials, procedures, and equipment with 100% hydrogen gas streams. The scope technical assessment will be completed in accordance with:

· Onsite testing at Spadeadam within 100% Hydrogen environment, including installation and testing of grouted 18” Stopple system

· Analysis and review of suitability of current PMC policies and performance specification for Hydrogen

· Review of maintenance certification

· Support and develop suitable performance testing regime of stopple against BISEP

· Final performance analysis delivered in a technical report

Objective(s)

The objectives of the project are to:

· To test currently used stopple equipment to determine if these can be used to stop the flow of gas in a hydrogen environment ahead of any hydrogen transition.

· Capture details of sealing capabilities of stopple equipment, in this instance Shortstop II.

· Compare sealing capabilities against current business policies

· Capture details of the condition of the sealing elements post stopple operation.

· Determine what if any modifications may be required to current equipment for use in a hydrogen filled pipeline

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

An assessment of distributional impacts (technical, financial and wellbeing related) for this project has been carried out using a bespoke assessment tool, which assesses the project as having a positive, negative or neutral effect on consumers in vulnerable situations. To help inform the assessment, this tool considers the categories of consumers identified in the Priority Services Register[BA1] . The outcomes of the project will not adversely affect vulnerable customers but feeds into a wider piece of work to decarbonise the gas network. Other projects will explore how vulnerable customers will not be left behind on this journey.

Success Criteria

The following key criteria need to be met for the project to be considered successful:

- Objectives met to time and cost
- Stopple operation fully completed and sealing success as per current tooling specification with natural gas, or not noted
- Equipment stripped following operation and details captured of the affects of hydrogen on sealing elements

Project Partners and External Funding

SGN

National Gas Transmission

Pipeline Integrity Engineers Ltd

GL Industrial Services UK LTD trading as DNV

Potential for New Learning

The current stopple equipment used on the NTS has been in operation for some time and is tried and tested. The outputs of this trial will show how this equipment reacts within pipelines carrying hydrogen rather than natural gas. It will show whether a seal can still be made to stop the flow of gas, and maintenance work on the equipment following the operation will show what, if any damage has been caused. It will allow the start of any development of the technology to be hydrogen ready ahead of any transition to a hydrogen gas network. This outputs from the trial will be collated in the form of a report and shared on the ENA portal.

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 stopple is the current GB industry standard tool used for this, as such the requirement to determine its operational performance within 100% Hydrogen. The project involves a standard 18” stopple operation carried out on the hydrogen test rig at Spadeadam.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL6 Large Scale

Geographical Area

The trial will be carried out at the hydrogen test rig at Spadeadam, which falls within Northern Gas Network’s geographical area

Revenue Allowed for the RIIO Settlement

NA

Indicative Total NIA Project Expenditure

£ 311,866

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:

The project will provide outputs detailing how stopple equipment that is currently used across all gas networks operates within a hydrogen environment. Networks will require equipment that is hydrogen ready to carry out flowstopping/isolation activities to maintain the gas networks, post an energy transition to hydrogen.

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

Continuity of supply is a critical requirement when transporting gas through the local and transmission networks. The stopple enables network upgrades, connections and repair activities to take place on the network without adversely affecting the supply to consumers.

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)

NA

Please provide a calculation of the expected benefits the Solution

This project will give evidence of the sealing capabilities of our current stopple equipment in a hydrogen environment. This operation is required across all the gas networks to undertake essential maintenance works

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

The testing of the stopple equipment can only be done at Spadeadam with the hydrogen test rig before any live field trials are carried out.

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

N/A – The project does not intend to rollout anything, but outputs generated as part of the project will be essential for ensuring relevant stopple equipment used to help maintain the UK gas networks can either still be used following a hydrogen transition or can be developed to undertake the same activities.

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)

NA

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.

NA

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 NIA framework offers a robust, open framework to support this work and ensures the results are disseminated to all licenses.

This project has been approved by a senior member of staff

☑ Yes