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

Jan 2019

Project Reference Number

NIA_SGN0139

Project Registration

Project Title

The Future of LTS

Project Reference Number

NIA_SGN0139

Project Licensee(s)

SGN

Project Start

January 2019

Project Duration

1 year and 5 months

Nominated Project Contact(s)

Nancy Thomson SGN Energy Future Project Manager

Project Budget

£321,295.00

Summary

The recent report by The Committee on Climate Change highlighted that Hydrogen is a credible option for the future. SGN have identified the potential for using the Local Transmission Network (LTS) for storing and distributing Hydrogen, Hydrogen blends and CO2.
The project will assess the feasibility and safety implications of the LTS for storage and transport of these gases.

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

In order to assess the pathway to decarbonisation research has been carried out by the Gas Distribution Networks and National Grid Gas Transmission into the potential use of Hydrogen and Hydrogen blend within the networks.

These projects have been investigating the feasibility of Hydrogen as a fuel, and the UK Government have also commissioned further work on Hydrogen within domestic appliances. Some networks are also investigating the use of Hydrogen for industrial use.

The recent report by The Committee on Climate Change (22/11/2018) highlighted that Hydrogen is a credible option for the future. SGN have identified the potential for using the Local Transmission Network (LTS) for storing and distributing Hydrogen, Hydrogen blends and CO_2.

Method(s)

In order to assess the feasibility and safety of the LTS for storage and transport of these gases, SGN are working with HSL to assess the scientific and regulatory feasibility. The objective of this project is to complete full range of evidence to support this scenario and identify any associated trials that would contribute to answering the feasibility, safety and regulatory questions.

There will be a written review report of the capability of the LTS to store and distribute hydrogen, hydrogen blend and CO_2, and a Case Study produced on the existing decommissioned pipe between Granton and Grangemouth that might later be used as a potential LTS

testing facility.

The report will include any potential challenges that would prevent the storage and distribution of hydrogen, hydrogen blend and CO_2 in the LTS and will include any specific recommendations for mitigation. The review will include all considerations identified in the problem statement and a clear Go/No Go decision to move on to the next phases of physical trials.

There will be a phased approach to answering this challenge problem.

Phase 1
Will be a feasibility and scoping phase split into two workstreams.

Phase 1a - LTS Pipeline Characterisation study
Will look at LTS pipeline characterisation to establish how the existing system could be re-purposed in the context of a de-carbonised gas grid.

Phase 1b - Grangemouth to Granton Feasibility study
Will look specifically at the Grangemouth to Granton feasibility. This will include a review of consents for storing and transporting Hydrogen, Hydrogen blend and CO_2.

Scope

This project will establish what may be required to prove that an existing LTS pipeline can be used to transport or store either hydrogen, hydrogen blend or CO_2. It will specifically look at:

- Proposed future carrier gas specifications
- Materials effects of these carrier gasses on pipeline integrity over time
- Identification of any additional operational aspects that will need to be considered
- Hazardous area changes which will characterise likely risk differences based on pipeline vintage
- Review IGEM/TD/1 original and later revisions
- Review latest standards applicable to carrier pipelines for NG, H_2 and CO_2
- Identify the fundamental differences in the design and operation characteristics of these systems
- Identify the key areas of risk if these gases were to be stored or transported in the LTS system and formulate risk comparison matrix
- Establish what permissions would be needed for re-purposing for use for either hydrogen, hydrogen blend or CO_2

This workstream will be a predominantly desk based exercise of subject expert reviews of relevant information and literature and providing the findings in a written report.

Phase 1
The objective for this work package is to establish the requirements to re-validate the Granton to Grangemouth pipe for conventional use. It will involve

- A review of existing records and pipeline information
- Review past use, maintenance and usage history
- Review the status of current protective measures i.e. N_2 fill, and efficacy of CP
- Provide a recommendation of inspection data required to establish pipeline integrity for possible future uses
- Carry out a review of existing permissions and establish their suitability to re-purpose for future uses of Hydrogen, Hydrogen blend and CO_2.

This will involve:

- Use of HSE's National Population Database to review current risk profile along the pipeline route
- Establish likely change to any risk zones associated with re-purposing Grangemouth Pipe
- Consult with HSE and other regulators to establish barriers to re-commissioning and re-purposing
- Engage with HSE and other regulators to establish timelines for regulatory approval
- Establish any risks associated with a change in land use along the pipeline and possible mitigations to these risks
- Recommend any laboratory or offline testing needed to support the evidence base for pipe re-purposing
- Pipeline specific risk assessment & gap analysis

The conclusion of phase 1 will produce a 'Go, No go' decision on whether further phases will be relevant depending on the outcome of the assessment and case study. Should there be a recommendation for further phases, the detailed scope of what those phases will include will be developed and costed as a separate proposal to Phase 1.

Phase 2
Will be Laboratory and offline testing and the scope of this would be identified and developed in Phase 1.

Phase 3
Will be Grangemouth to Granton Pipeline Integrity Testing which would include Hydraulic testing and PIG - wall thickness, defects, coating thickness.

Phase 4
Demonstration of use for hydrogen/CO2 that will include Experimental design and Risk assessment.

Phase 5
Will include Engineering Design and HAZID.

Phase 6
QRA which will address all known and new risks and assign frequency.

Objective(s)

The objectives of this work are to answer key questions around the suitability of the existing LTS to store and transport hydrogen, hydrogen blend and CO_2 and develop a scope for testing the assumptions made in the assessment. This would act as a proof of concept for online trials.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

This project will provide an understanding of the capability of the LTS to store and transport hydrogen, hydrogen blend and CO_2. There will be a clear prospect for the role of the LTS within a future hydrogen transport and storage system and a well-defined pathway of the steps required to reach confidence for this conclusion.

Project Partners and External Funding

Project Partner - Health & Safety Laboratory (HSL)

Potential for New Learning

This project could expand the understanding of the capabilities of the LTS and other assets for the storage of hydrogen, hydrogen blend and CO_2. It could also identify opportunities for future hydrogen innovation and be a critical milestone on the pathway to decarbonisation.

Scale of Project

This project will be a combination of desktop study and consultation with regulators, evaluating existing technical information, guidance and standards and engaging with industry.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

UK

Revenue Allowed for the RIIO Settlement

This is a low TRL research project, therefore not applicable.

Indicative Total NIA Project Expenditure

The total project expenditure is £321,295, 90% (£289,166) of which will be recovered via the NIA funding mechanism in line with the funding conditions.

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)

In order to meet its climate targets the UK needs to decarbonise by 2050. To achieve this effectively and economically all options for decarbonisation should be evaluated in order to find the most cost effective solutions for the UK consumers.

Please provide a calculation of the expected benefits the Solution

Indeterminate at this stage, research project (see commentary above)

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

Most LTS pipeline systems in the UK were designed and constructed to similar standards so feasible to assume that any benefits can be replicated throughout all UK networks.

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

As this is a research project, there are no associated roll out costs.

The use of the LTS for storage and distribution of hydrogen or CO_2, both within the UK and at local level, would be highly advantageous for the supply and delivery of energy to consumers.

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

☐ 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

There are numerous research activities exploring the use of hydrogen and hydrogen blends in distribution networks together with a growing need to support CO_2 capture systems. However storage and transport options using the LTS have not been looked at in any focussed study. The use of the LTS for localised storage of hydrogen or CO_2 would contribute to effective and widespread use of hydrogen for energy and capture of CO_2 within the UK. This would be relevant for all network operators.

Specific information on the impact of hydrogen and hydrogen blends on materials used in the LTS and effect on any consents, particularly when storing hydrogen, and use of this information to inform potential further study on barrier lining techniques and materials.

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.

Project scope was reviewed against all existing projects and no areas of duplication where identified.

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 programme will provide a review of the impact of storing, and transporting, hydrogen within the LTS. The approach itself combines a range of specialist expertise, together with infrastructure and operating data, to provide an overall view of the optimised output.

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

The pathway to decarbonisation of the LTS requires a robust and scientific review to ensure that all critical technical, operational and safety challenges and risks have been considered. The development of the LTS as a storage solution as an output of this study will help to inform the ongoing research activities within the distribution and transmission level. The NIA framework offers a robust, open framework to support this work and ensure the results are fully articulated to all stakeholders.

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 NIA project has a low TRL and involves carrying out a conceptual study. This project is applicable to all the GDN's where the learning can be shared between the networks.

This project has been approved by a senior member of staff

☑ Yes