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

Nov 2022

Project Reference Number

NIA_NGGT0202

Project Registration

Project Title

Technical and Commercial Impact of High Pressure Carbon Transportation

Project Reference Number

NIA_NGGT0202

Project Licensee(s)

National Gas Transmission PLC

Project Start

November 2022

Project Duration

0 years and 6 months

Nominated Project Contact(s)

Helen Dugdale, box.GT.innovation@nationalgrid.com

Project Budget

£393,333.00

Summary

GT&M are looking at the opportunity for the gas network to provide carbon transportation through the transition. The project looks to provide insight into the technical challenges and safety implications of onshore transportation, review opportunities for repurposing and new pipelines, consider route requirements and opportunities for on route utilisation of these gases to reduce the storage requirement and consider the wider commercial and market impacts of Carbon Capture, Usage and Storage (CCUS).

An initial focus area for which this project can be framed is in the Scotland region to support the development of the Scottish Industrial Cluster.

Third Party Collaborators

Guidehouse

Nominated Contact Email Address(es)

Box.GT.Innovation@nationalgrid.com

Problem Being Solved

Gas Transmission and Metering (GT&M) are committed to supporting the delivery of the Net Zero Transition by 2050, through the transition of the transmission network to delivering net zero gases to consumers. Whilst gases such as hydrogen, synthetic gas and biomethane provide solutions for net zero energy carriers, some production methods for these fuels can produce unwanted emissions. Alongside this in the transitional period it is possible that users will still utilise natural gas and therefore continue to emit harmful emissions. A key element of the transition is in the capture, use and storage of these emissions to prevent them escaping to atmosphere.

GT&M are looking at the opportunity for the gas network to provide carbon transportation through the transition. The project looks to provide insight into the technical challenges and safety implications of onshore transportation, review opportunities for both repurposing and construction of new pipelines, consider route requirements and opportunities for enroute utilisation of these gases to reduce the storage requirement and consider the wider commercial and market impacts of Carbon Capture, Usage and Storage (CCUS).

CCUS is a key enabler to the production of blue hydrogen and also supports the decarbonisation of the existing natural gas network, and therefore should be viewed as complementary to our core strategy of the transition to hydrogen and hydrogen blends. It will be one of the building blocks for a net zero future. However, the use of feeders for CCUS has to be considered against the opportunity of using the same infrastructure for hydrogen and supporting the decarbonisation of the grid in a different way.

Method(s)

Work Package 1: Scenario Definition

- Hold kick-off meeting and establish project governance and baseline scope activities
- Agree on the objectives of the work and co-select the relevant prority focus areas
- Agree the technical requirements for the transportation of CO2 via pipeline and the scope of this study
- Agree the commercial requirements and datasets
- Conduct a robust literature review of current and existing studies/initiatives in the UK CO2 pipeline space

Work Package 2: Technical Feasibility

- Evaluate current NTS assets for CO2 repurposing
- Assess high-level feasibility of new build CO2 pipeline
- Compare and contrast the technical feasibility of the repurposing vs new build options.
- Assess repurposing implications for CO2 to H2 transition and identify mitigations
- Identify and characterise potential local users of CO2

Package 3: Commercial Feasibility

- Conduct Value Chain Analysis of CO2 pipeline to UK Economy
- Conduct assessment of maturity of CO2market including regulatory frameworks
- Conduct impact assessment to facilitate HSE discussions
- Consider the business model options for the CO2 pipeline
- Conduct an evaluation of the end to end supply and demand of CO2 including local demand, offshore storage capacity and alternative CCUS technologies eg. EOR
- Develop a comparison and strategy of whether Feeder 10 should be converted to H2 or CO2.

Work Package 4: Stakeholder & Regulatory

- Develop stakeholder and regulatory landscape map and plan
- Engage stakeholders through value chain to ascertain market maturity
- Prepare and deliver virtual stakeholder dissemination event
- Collect feedback and collate recommendations
- Complete final report and ENA Closure activities

Measurement Quality Statement

The measurement approach used to meet Data Quality objectives will be through the identification of high calibre project partners who are experts in their given field. The methodology used in this project will be subject to our supplier's own ISO 9001 certified quality assurance regime and the source of data, measurement process and equipment as well as data processing will be clearly documented and verifiable. The measurements, designs and economic assessments will also be clearly documented in the relevant deliverables and final project report and made available for review.

Data Quality Statement (DQS)

The project will be delivered under the NIA framework in line with the agreed Energy Networks Innovation Process document NGGT / NGET internal policies. Data produced as part of this project will be subject to quality assurance to ensure that the information produced with each deliverable is accurate to the best of our knowledge and sources of information are appropriately documented. All deliverables and project outputs will be stored on our internal SharePoint platform ensuring backup and version management. Relevant project documentation and reports will also be made available on the ENA Smarter Networks Portal and dissemination material will be shared with the relevant stakeholders.

Scope

In Scope:

- Onshore pipeline technical assessment
- Technical and Commercial output impact on routing of pipelines
- Review of technologies to support use of carbon emissions as an alternative to storage
- Storage and production requirements (flow rates, pressures etc…)
- Transport of gas only – specification to be defined in the project
- Transmission repurposing and new build options
- Scottish Cluster focus with considerations for other UK applications

Out of Scope:

- Offshore pipeline recommendations
- Storage mechanisms or systems
- Production mechanisms or systems

Objective(s)

- Provide an evidence-based technical and commercial report on the viability of CCUS to enable GT&M to build a business case to make future investment decisions.
- Consider the technical and commercial feasibility of new build pipeline for CCUS and subsequent conversion to a hydrogen pipeline at a later date.
- Compare the business case for CCUS with the business case for hydrogen to allow for informed future investment decisions.

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.

This project has been assessed as having a neutral impact on customers in vulnerable situations. This is because it is a transmission project.

Success Criteria

WP1: Scenario Definition

- Report defining technical requirements
- Report benchmarking technical requirements for CCUS

WP2: Technical Feasibility

- Report chapter detailing the assessment of existing GT&M assets
- Report chapter considering the case for new build pipeline
- Report chapter detailing the repurposing of CCUS asset
- Report chapter identifying CO2 opportunities

WP3: Commercial Feasibility

- Report chapter detailing economic value of CO2
- Report chapter detailing the perceived maturity of the regulatory framework
- Report chapter containing the impact assessment
- Report chapter CCUS business case with hydrogen

WP4: Stakeholder & Regulatory

Report chapter detailing which stakeholders have been engaged and the minutes from the discussion sessions
Report chapter detailing stakeholder recommendations

WP5: Standards & Reporting

Requirements: Desktop study report

- WP Acceptance Criteria: Final report is delivered from supplier.
- GT&M review and accept final report.
- ENA Project Closure form is also populated by supplier.
- Project is then registered as complete.

Project Partners and External Funding

This project will be delivered by Guidehouse and Premtech. There is no external funding

Potential for New Learning

The learning from this project will increase understanding of the current landscape for CCUS in the UK, specifically in the Scottish Industrial Cluster (but the outcomes will be broadly applicable to CCUS across the UK). This learning will be disseminated with the use of a published final project report.

Scale of Project

The scale of the project is mainland UK, which is considered appropriate as the NTS covers the whole area. A smaller scale would generate insufficient information regarding the opportunities for GT&M

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

The results of this project would be applicable across the UK.

Revenue Allowed for the RIIO Settlement

Not applicable to this project

Indicative Total NIA Project Expenditure

This project will be delivered by Guidehouse and Premtech, with National Grid Gas as the lead network

External Cost: £295,000

Internal Cost: £98,333.33

Total Cost: £393,333.33

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:

Gas Transmission and Metering (GT&M) are committed to supporting the delivery of the Net Zero Transition by 2050, through the transition of the transmission network to delivering net zero gases to consumers. Whilst gases such as hydrogen, synthetic gas and biomethane provide solutions for net zero energy carriers, some production methods for these fuels can produce unwanted emissions. Alongside this in the transitional period it is possible that users will still utilise natural gas and therefore continue to emit harmful emissions. A key element of the transition is in the capture, use and storage of these emissions to prevent them escaping to atmosphere.

CCUS is a key enabler to the production of blue hydrogen and also supports the decarbonisation of the existing natural gas network, and therefore should be viewed as complementary to our core strategy of the transition to hydrogen and hydrogen blends. It will be one of the building blocks for a net zero future.

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)

RIIO-1 Question N/A

Please provide a calculation of the expected benefits the Solution

This is a research project so there is no calculation of the expected benefits

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

This is a research study and it is not possible to provide indicative implementation costs before this work has concluded.

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

This is a research study and it is not possible to provide indicative implementation costs before this work has concluded.

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 analysis of geographical demand for CCUS, alongside the value chain analysis of CCUS to the UK economy is relevant for all Network Licences. As is the work planned to understand the regulatory landscape map and plan, and the understanding of carbon market maturity.

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

RIIO-1 Question N/A

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.

The work conducted as part of this project follows on from previous work considering CCUS. The technical and commercial ideas are developed further and the effect of a hydrogen backbone on a CCUS business case has not previously been considered. The business case and technical design for new build pipeline will also consider the conversion to hydrogen at a later date.

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

To date, the NTS has never been used for the purpose of CCUS. But with the move towards decarbonisation, there is increasing interest in CCUS as a key enabler to the use of blue hydrogen. Other solutions for net zero carriers (synthetic gases and biomethane) also have production methods that produce unwanted emissions, therefore there is interest in the capture and transportation of these emissions to prevent their release into the atmosphere.

The comparison between the commercial business cases for hydrogen and CCUS pipelines has not been conducted previously. Nor has the design of new build pipeline where a conversion to hydrogen is considered.

Relevant Foreground IPR

The foreground IP created in this project are identifying the role the NTS could play in the use of CCUS to enable the transition to Net Zero.

Data Access Details

Data for this project, and all other projects funded under the Network Innovation Allowance (NIA) funding scheme, can be found or requested in a number of ways:

A request for information (RFI) via the Smarter Networks Portal at https://smarter.energynetworks.org. National Grid Gas Transmission regularly publishes much of the data arising from our innovation projects on the ENA portal, before submitting a RFI check this website.

Via our managed mailbox box.GT.Innovation@nationalgrid.com. Further data can be shared upon request through the innovation mailbox. Each request will be assessed by the GT Innovation Team for its merits and viability.

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

The transportation of gaseous carbon emissions is not business as usual for a natural gas transmission network.

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

There are risks with the technical, commercial and regulatory feasibility of the possibility of repurposing existing assets for CCUS and with the commercial feasibility to building new pipeline for the use of CCUS. There is also the risk that if the conversion of the NTS to hydrogen is not accepted, then significant parts of this work are no longer valid.

This project has been approved by a senior member of staff

☑ Yes