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

Aug 2020

Project Reference Number

NIA_NGN_268

Project Registration

Project Title

H21 Occupied Trials – Phase One

Project Reference Number

NIA_NGN_268

Project Licensee(s)

Northern Gas Networks

Project Start

August 2020

Project Duration

1 year and 0 months

Nominated Project Contact(s)

Russ Oxley

Project Budget

£40,500.00

Summary

As part of the overall H21 Project; and detailed in the Executing the H21 Roadmap document, this project will follow Phase 1 of the H21 NIC project and work in parallel with Phase 2 [H21 NIC project], to undertake the pre-requisite activities required to allow the H21 Occupied Trial (Phase 3).

Preceding Projects

NIA_NGN_270 - H21 Initial Hydrogen Supply Strategy

NIA_NGN_275 - H21 – Hydrogen Ready Services

NIA_NGN_276 - H21 - Hydrogen Ready Components

NIA_NGN_302 - H21 - Wider Impacts of Hydrogen

NGN_NIA_344 - H21 Ignition Consequence Research

NIA_NGN_348 - H21 Occupied Trials Phase 1 - Safety Case

Third Party Collaborators

DNV

HSE Science Division

Aqua Consultants

Nominated Contact Email Address(es)

innovation@northerngas.co.uk

Problem Being Solved

As part of the overall H21 Project; and detailed in the Executing the H21 Roadmap document, this project will follow Phase 1 of the H21 NIC project and work in parallel with Phase 2 [H21 NIC project], to undertake the pre-requisite activities required to allow the H21 Occupied Trial (Phase 3).

The H21 project aims to demonstrate the feasibility of using 100% hydrogen in a gas distribution network and as part of the layering of confidence to the stakeholders and the HSE, a live trial on existing gas infrastructure connected to real customers is required after the unoccupied trials. Phase 3 occupied trials will demonstrate through a live trial in homes and a small business, that 100% hydrogen as a low carbon alternative for natural gas is safe, practical and achievable and can be delivered with less impact to consumers than other potential heat decarbonisation options.

Method(s)

A site has been identified for the occupied trials, utilising the existing HyDeploy 2 project site, located at Winlaton village in Gateshead. The project will convert houses from 20% blended hydrogen to 100% hydrogen in two stages, starting with an initial phase of 50 homes, utilising the HyDeploy 2 existing infrastructure and equipment following successful delivery of Hydeploy2 trials at the end of 2021.

The occupied trial will then move into a second phase converting the surrounding 670 homes including one business, a school and a church that were part of the Hydeploy2 trial.

The HyDeploy 2 project utilises a blended hydrogen methane mix up to 20% hydrogen and many of the components purchased by NGN for this project can be re-purposed for the H21 Phase 3 Occupied Trial. The H21 project differs from the HyDeploy 2 project as it is a conversion to 100% rather than a blend and so in order to deliver the H21 Occupied Trial at 100% hydrogen, a different set of prerequisites reviewing and completing where possible prior to the conversion trial. Review and completion where possible of these prerequisites prior to commencing the trial will be covered under this NIA project.

The prerequisites include such requirements as:

• Legal consents and exemptions;
• Confirmation of Hydrogen production and supply;
• Surveying of the existing system and homes;
• Co-ordinating supply of the required appliances;
• Co-ordinating stakeholder engagement;
• Duty holders approval.

This NIA project will be delivered in two phases. This PEA relates to Phase One and will be delivered in three stages:

• Stage 1 – Detailed Review of the Site - To review the site and identify houses to be included in the Trial through Network Modelling.
• Stage 2 – Ascertain Prerequisites - Required to assess the prerequisites that require addressing to allow the H21 Phase 3 project to commence.
• Stage 3 – Review & Report - To bring together the selection of properties for the initial H21 Phase 3a converting circa 60 houses and Phase 3b converting the remaining >600 properties and confirmation of the prerequisites that require completing, where possible, during Phase 2 of this project.

Scope

The project scope will include researching and completing, where possible, the following prerequisites to the H21 Phase 3 Occupied Trials project:

• Understanding the Legal and Regulatory requirements for running the phase 3 occupied trials:
- HSE Exemption for 100% hydrogen;
- UNC Derogations;
- GS(M)R;
- Billing;
- Other Legal and Regulatory License Requirements.
• Hydrogen production and storage requirement to meet 1 in 20 peak demand and provide resilience:
- Identify the most suitable sources of Hydrogen based on site conditions;
- Volume of Hydrogen based on calculated demand levels;
- Storage requirements.
• Modelling for sectorisation and natural gas transition to 100% hydrogen.
• Modelling for network sizing to ensure the 1 in 20 can be met i.e. velocities and pressure restrictions encompassing existing mains and services population for the specific area.
• Asses other options for temporary provision of heat during supply interruption.
• Equipment compatibility across the gas network.
• Analyse the Phase 1 QRA output for any mitigation measures, i.e. excess flow valves, meter boxes on external walls.
• Liaising with appliance manufacturers for availability of replacement appliances in the required timescales.

• Preparation of stakeholder engagement and communication plans.

Objective(s)

To undertake the required prerequisites to allow the H21 Phase 3 Occupied Trial on 100% hydrogen to be undertaken post completion of the HyDeploy2 project at the end of 2021.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Successful completion of the review of all prerequisites listed in the scope to allow the H21 Phase 3 Occupied Trials project to immediately proceed upon any award of future funding.

Project Partners and External Funding

NGN will lead the project as part of the H21 NIC bid consortium with support from the wider H21 NIC project partners. Primarily:
• DNV GL – As defined in the H21 NIC bid document.
• HSE Science Division – As defined in the H21 NIC bid document.
• Aqua – for provision of Senior QS.

Potential for New Learning

The elements of the H21 NIC projects will only provide the controlled environment testing results to support a 100% hydrogen gas grid conversion. All stakeholders (including the HSE-SD, DNV GL, GDN Asset Directors and Local Authorities) agree that, as with all controlled testing, and the unoccupied testing, definitive assessment can only be corroborated with in-situ testing via an occupied trial. This NIA will research and complete the prerequisites to allow the occupied trial on 100% hydrogen to proceed.

Ultimately the occupied trial will confirm the results of the H21 Phase 1 & 2 stages and then demonstrate the findings in an occupied trial and provide definitive evidence for hydrogen as a fuel establishing the evidence for customer acceptability. And final assurance that hydrogen is as safe and reliable as the existing gas networks.

Scale of Project

This project inputs into the success of the H21 Project which will provide critical information applicable to the entire UK gas system when considering conversion to 100% hydrogen incrementally over time.

Technology Readiness at Start

TRL5 Pilot Scale

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

The project will be based in the NGN network area but will be applicable and deliver learning appropriate to the entire UK gas distribution system.

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

External Cost = £0
Internal cost = £40,500
Total Cost = £40,500

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)

This project is one of a suite of projects to enable a conversion of the UK gas grid to hydrogen. Repurposing the UK gas networks with hydrogen to support the challenge of the climate change act has the potential to save £46 billion with minimal gas customer disruption verses alternative decarbonisation solutions

Please provide a calculation of the expected benefits the Solution

N/A

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

The research and learning undertaken as part of completing the prerequisites for H21 Occupied Trials site is applicable to all GDNs within the UK undertaking future Hydrogen conversion projects.

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

The research and learning undertaken as part of completing the prerequisites for H21 Occupied Trials site is applicable to all GDNs within the UK undertaking future Hydrogen conversion projects.

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 review and completion of the prerequisites to the occupied trial site is part of the H21 Innovation project which will test the ability to convert and operate the gas network to 100% hydrogen through an occupied demonstration trial. All evidence associated with the conversion of the UK gas distribution networks to 100% hydrogen is applicable to all GDNs within the UK as the networks have the same construction and design parameters.

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

Future of the gas networks

☑ 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.

Conversion of the existing gas network to 100% hydrogen has not be delivered in the UK before. The H21 Occupied Trials project has been discussed at all industry forums e.g. GFG, HPDG etc. to ensure effective collaboration.

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

This project will build on the original work of the H21 Leeds City Gate project and the H21 Phase 1 & 2 NIC projects and provide valuable knowledge and learning to inform some of the next steps identified in the H21 road map. The completion of the prerequisites for the Occupied Trials for 100% hydrogen conversion on an area of the existing gas network has never been undertaken before.

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

This project is in the interests of UK and is not specific to business as usual operations of the network with no allowance within regulatory business plans. Whilst the benefits are undeniable there is no guaranteed benefit back to gas customers without regulator and government support– projects associated with 100% hydrogen are at the cutting edge of gas network innovation.

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 project would only be undertaken with support from NIA funding, it is in the interests of gas customers, the regulator and the UK government and realization of any benefits are outside the control of the gas networks. There is no allowance in BAU business plans for this type of work and the commercial benefits and technical/operational risks associated with these type of 100% hydrogen projects are outside the traditional environment of any gas distribution network or its shareholders.

This project has been approved by a senior member of staff

☑ Yes