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## NIA Project Registration and PEA Document

### Date of Submission

Jan 2021

### Project Reference Number

NIA\_NGN\_275

## Project Registration

### Project Title

H21 – Hydrogen Ready Services

### Project Reference Number

NIA\_NGN\_275

### Project Licensee(s)

Northern Gas Networks

### Project Start

January 2021

### Project Duration

0 years and 8 months

### Nominated Project Contact(s)

Russ Oxley

### Project Budget

£117,289.00

## Summary

The project is to review the existing domestic service population to ensure current levels of security of supply is maintained to our customers following conversion of the network to 100% hydrogen. This project will provide an output report detailing the findings and the volume of replacement service work required to allow conversion to 100% hydrogen.

## Preceding Projects

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

## Nominated Contact Email Address(es)

innovation@northerngas.co.uk

## Problem Being Solved

The UK was legally bound to make ambitious carbon reductions under the terms of the Climate Change Act (2008). However, the UK government signed legislation on 27th June 2019 committing the UK to a legally binding target of Net Zero emissions by 2050. Scottish Government committed to set targets of Net Zero emissions by 2045. This means the UK must tackle decarbonisation at

pace and change the way energy is produced, transported and consumed to meet this new target.

NGN and the other GDNs have committed to work with stakeholders and the government to work collaboratively towards a strategy to convert the gas distribution networks to hydrogen through the national Gas Goes Green initiative including projects such as the NGN H21 100% hydrogen project and the SGN H100 project.

In order to convert the network to 100% hydrogen the services must be assessed to ensure they are suitable for the supply of hydrogen, specifically to provide evidence that the service configurations can meet the required predicted increase in demand due to the lower caloric value of hydrogen.

Current data from the NGN SAP S4S system, as an indicator, shows that only 10% of the domestic connections are 25mm or greater in diameter, and 65% of connections are between 0-10m in length.

Services are likely to need upgrading, and so current strategies and procedures may need to be changed as soon as possible, in line with new connections and mains service replacement works which are currently in progress.

## Method(s)

The project will be delivered in four phases:

- Phase 1 – Modelling Assessment of Hydrogen Supply requirements based on required energy demand of typical hydrogen ready appliances to ascertain the predicted pressure drop for the various pipe diameters and lengths.
- Phase 2 - Validation of modelling assessment on H21 test rig.
- Stage Gate - At the end of Phase 2 a meeting will be held with all of the collaborative partners to review the findings of Phases 1 and 2 with the purpose of agreeing the best way forward for the actual delivery of Phases 3 and 4.
- Phase 3 - Collation of service connection data to gather the data held on the number of domestic customers by various pipe sizes and connection lengths.
- Phase 4 - Generate a report reviewing the customer data against model findings, calculating the volume of domestic customer connections that require upgrading.

## Scope

This project will review the service connections from the distribution network pipework to the ECV only. This will include:

- Modelling the hydrogen demand for the various pipe diameters and lengths.
- Validating the model results utilising the H21 Phase 1b equipment and houses.
- Collating the existing connection data from NGN systems.
- Applying the results of the modelling to the connection data.
- Reporting on the findings and making recommendations.

The scope does not include the pipework located on the property side of the ECV, i.e. the pipe between the ECV and the boiler. The scope also does not include Commercial and Industrial customers, only domestic customers. It will also not consider dual supply services as it is assumed any of these will need to be replaced by individual supplies to properties. It will also not cover domestic multi occupancy supplies such as risers and laterals.

## Objective(s)

To review the existing domestic service population to ensure current levels of security of supply is maintained to our customers following conversion of the network to 100% hydrogen. This project will provide an output report detailing the findings and the volume of replacement service work required to allow conversion to 100% hydrogen.

## Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

## Success Criteria

The project must ascertain if services require replacement to meet the increase in hydrogen demand due to the lower caloric value. The project will be measured successful if testing of various service diameters and lengths with 100% hydrogen is completed and a report produced detailing the findings and an estimate of the volume of future work need make services suitable.

## Project Partners and External Funding

This will be a collaborative project with Cadent, SGN and Wales and West Utilities. NGN will lead the project. The testing works will be undertaken by DNV GL at the Spadeadam testing site

## 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. BEIS have stated that further investigation is required to demonstrate that current and future services are sized correctly to be suitable for the increase in hydrogen gas flow due to the lower calorific value of hydrogen compared to natural gas.

The output of this project will provide vital information to the UK GDNs and the gas industry as a whole as to the suitability of services for 100% hydrogen and will highlight any need for UK GDNs to change services within their 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

TRL2 Invention and Research

## Technology Readiness at End

TRL5 Pilot Scale

## Geographical Area

The project will be based in the NGN network area but will include service data from the other GDNs and the output 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 funding = £51,490

Cadent: £25,745

NGN: £6,436.25

SGN: £12,872.50

WWU: £6,436.25

Internal cost = £65,799

Cadent: £6,436

NGN: £ 54,000

SGN: £3,218

WWU: £2,145

Total Cost = £117,289

## 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

Research Based Project.

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

This project will feed into a wider project dealing with the conversion of the gas network to hydrogen, the roll out of cots of these are yet to be defined but this project will help to establish the most expediated way to commence conversion.

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

This project will feed into a wider project dealing with the conversion of the gas network to hydrogen, the roll out of cots of these are yet to be defined but this project will help to establish the most expediated way to commence conversion.

### 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 trialed 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 services testing project is part of the delivery of the H21 Innovation project. 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 construct 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.

The research and testing of services of various diameters and lengths with 100% hydrogen has not been undertaken before.

### 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 research and testing of services of various diameters and lengths with 100% hydrogen has not 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 part of its 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