

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

Oct 2021

Project Reference Number

NIA2_SGN0006

Project Registration

Project Title

Industrial & Commercial Plant Hydrogen Sensitivity Assessment

Project Reference Number

NIA2_SGN0006

Project Licensee(s)

SGN

Project Start

October 2021

Project Duration

1 year and 3 months

Nominated Project Contact(s)

Phil Bradwell

Project Budget

£86,665.00

Summary

This project will assess the impact of transition to hydrogen through hydrogen/natural gas blends and 100% conversion for downstream industrial and commercial installations by the collection of gas user information. Although information for large, major industrial users is available as they must report emissions are part of their permit to operate, there are fewer available details for medium scale industrial and commercial installations. The collection of gas user information will provide a database register that identifies potential sensitivities with appropriate mitigations

The project is critical in providing a logical and repeatable methodology that can be applied by all GDN operators to capture required information prior to a transition of the network to hydrogen. This will allow optimisation of decarbonisation in the network and provide insight to the current level of customer interest in plant conversion or replacement to hydrogen from natural gas.

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

The UK has committed to a target of Net Zero emissions by 2050. In order to achieve these ambitious decarbonisation targets, the energy system must evolve from current fossil fuel dependency to low carbon alternatives. The Gas Networks have set out a portfolio of work to deliver evidence for the transformation of the gas network in the form of a pathway to decarbonisation. In the initial stages of transition, decarbonisation can be offered through injection of biomethane or hydrogen/natural gas blends. However, in order to provide full decarbonisation, 100% hydrogen delivery through gas network infrastructure must be evidenced and developed. A fundamental requirement of this decarbonisation pathway is to understand the impact of a transition to hydrogen on gas users.

This study will investigate and evaluate the impact of transition to hydrogen through hydrogen/natural gas blends and 100% conversion for downstream industrial and commercial installations by the collection of gas user information. Although information for large, major industrial users is available as they must report emissions are part of their permit to operate, there are fewer available details for

medium scale industrial and commercial installations. The collection of gas user information will provide a database register that identifies potential sensitivities with appropriate mitigations.

The project is critical in providing a logical and repeatable methodology that can be applied by all GDN operators to capture required information prior to a transition of the network to hydrogen. This will allow optimisation of decarbonisation in the network and provide insight to the current level of customer interest in plant conversion or replacement to hydrogen from natural gas.

The findings from this project will provide beneficial information to ongoing SGN projects such as Aberdeen Vision, North East Coast and Industrial Cluster and Southampton Water projects, all looking to stimulate the hydrogen economy. This project aligns to the future of gas, future of heat and decarbonisation aspects within SGN's Energy futures Strategy.

Method(s)

The study will focus on developing and improving data sources and information to enable and assessment to be made on the potential for low carbon operation on medium scale gas-fired combustion equipment. It will require determination of the number and types of combustion equipment, the location and connection to the gas network, and then a technical appraisal potential to utilise hydrogen/natural gas blends. The project will be undertaken in the region of Aberdeen. The analysis will provide support to SGN's key decarbonisation project in the region, the North East Coast and Industrial Clusters project. The study will cover 5 main areas that include:

1. Initial site location data collection
2. Data gap identification
3. Additional data collection to address current data gaps
4. Data evaluation and analysis
5. Reporting

The outcomes from this project will be a report illustrating the numbers and types of combustion equipment for commercial and industrial installations in the Aberdeen region. Their compatibility for hydrogen blends and 100% conversion will be assessed to identify potential early adopters for conversion. The cost for conversion, timescales and willingness for end users to convert will also be detailed within the report. The study will also produce an analysis baseline database of plant types/make models that can be rolled out and shared with other GDN's and gas users with appropriate anonymity.

Scope

This project will aim to build and improve data sources on medium scale industrial and commercial installations to enable an assessment to be made on the suitability for transition to hydrogen. The scope of the study will cover:

- **Initial site location data collection** - Investigation of the Aberdeen study site to locate existing information to understand connections and gas use for commercial/industrial plants.
- **Data gap identification** - Acquire further end use data that has not been identified in the initial work package of the project.
- **Additional data collection to address current data gaps** - Engage with gas end users to understand installed combustion equipment to close gaps identified in previous work packages.
- **Data evaluation and analysis** - Evaluate all combustion equipment installed in the Aberdeen region, providing an initial view on the potential suitability of the equipment to use hydrogen/natural gas blends up to 20% volume.
- **Reporting** - Final reporting illustrating final populations of combustion equipment. Key systems that would support early adoption to 100% hydrogen will be shown with appropriate anonymity. Overall willingness for conversion to hydrogen from engagement will be quantified.

Objective(s)

The objectives of this project are to:

- Data analysis to determine numbers and types of combustion equipment in the Aberdeen study area.

- An evaluation of the compatibility for 20% hydrogen by volume and ability to accommodate rapid rate of change from between 0-20%.
- Identify early adopters who could be suitable for 100% hydrogen
- Review status of existing plant/user feedback on willingness to convert to hydrogen, age of existing plant/options and estimated capital costs for conversion and customer potential timescales.
- Provide a proven logical methodology framework for networks to assess the impact of hydrogen on network users
- The production of an initial baseline database of plant types/make models that can then be rolled out and shared with other gas networks and gas users with appropriate anonymity.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

Not applicable

Success Criteria

The success criteria are as follows:

- Detailed reports for publication
- Production of a baseline database register for medium scale combustion equipment for use by other GDN operators
- Identification of early adopters for 100% hydrogen conversion
- Identification of sensitivities for transition to hydrogen for combustion equipment and provision of mitigations
- Quantification of the willingness for end users to convert to hydrogen from natural gas
- A repeatable methodology blueprint of other GDN operators to adopt when converting the network.

Project Partners and External Funding

The project will be led by DNV

Potential for New Learning

The project is expected to develop the following new learning for Network Licensees:

- A detailed assessment of the viability of medium scale commercial and industrial installations to convert to hydrogen from existing natural gas.
- An identification of which combustion equipment makes, and models can support early adoption of hydrogen.
- Evaluate the willingness of consumers to convert to hydrogen from natural gas.
- Develop a methodology to support further conversion of the UK network to hydrogen.
- Develop an understanding on the costs and schedule for conversion of existing combustion equipment to installations that would support the use of hydrogen blends and 100% hydrogen

Scale of Project

A study that will focus on developing and improving data sources and information to enable an assessment to be made on the potential for low carbon operation on medium scale gas fired combustion equipment. The project will establish details for the nominated study area of Aberdeen with findings able to support development of SGN's key decarbonisation project, North East Coast and Industrial Clusters. Learnings from the project can applied to future conversion of the network on a UK wide scale through production of a blueprint methodology assessing commercial and industrial installations viability for a transition to hydrogen from natural gas.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

The project will establish details and suitability for hydrogen conversion for the nominated study area of Aberdeen. Outputs of the project will provide a methodology that can be applied on a UK wide scale for conversion of the network to hydrogen.

Revenue Allowed for the RIIO Settlement

Not applicable

Indicative Total NIA Project Expenditure

£86,665

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:

Existing hydrogen projects are already starting to highlight challenges around conversion of the network and potential sensitivities of downstream gas users that require greater heat demands than domestic users.

The project will illustrate a clear approach of how this challenge can be tackled with identification of installations that may prove to be sensitive to hydrogen conversion. The study will also illustrate key systems that can promote early conversion of the network to 100% hydrogen supply.

Ensuring security of supply for consumers is of paramount importance to Network licensees. Therefore, understanding how installations will operate with hydrogen and potential sensitivities is imperative to understand necessary steps to take to make existing combustion equipment viable for hydrogen transition.

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

Not applicable

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)

Not applicable

Please provide a calculation of the expected benefits the Solution

Not applicable

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

The potential outcomes of this project are applicable across GDN's. All the Network Licensees are aiming to reduce carbon emissions through transition to hydrogen. The project will provide a robust framework that GDN's can utilise to convert operating areas to hydrogen and ensure security of supply for downstream commercial and industrial gas users.

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

Not applicable

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 learning gained from this project aims to inform Network Licensees of key commercial and industrial installations that can support a transition to hydrogen. The production and use of a plant database by Network Licensees will mitigate against any sensitivities to hydrogen and ensure full roll out of hydrogen in the network.

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

Not applicable

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.

While GDNs are participating in a variety of research projects relating to Hydrogen, this project is unique in its evaluation of medium scale commercial and industrial combustion installations for bulk Hydrogen supply and should have minimal direct overlap with other projects. On the other hand, as a supply mechanism it aims to compliment all GDN hydrogen projects.

If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

Not applicable

Additional Governance And Document Upload

Please identify why the project is innovative and has not been tried before

Hydrogen use for heating and injection is a new area of research being looked at within the GB industry. As a result, there has been

limited study on the potential impact or sensitivities there are with this transition for medium scale commercial and industrial gas consumers. Therefore, the project is of pivotal importance to ensure transition to hydrogen is viable and can ensure security of supply for downstream users.

Relevant Foreground IPR

Not applicable

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 aims to address long term issues of reduce carbon emissions and assist UK in meeting the UK 2050 CO2 reduction target.

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 will produce a methodology for conversion of medium scale installations from current operation on natural gas. It will involve carrying out an initial analysis and production of a baseline data register as part of the study that can inform GDN operators for conversion to hydrogen.

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