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

Sep 2022

Project Reference Number

NIA_NGGT0196

Project Registration

Project Title

Gas & Fire Detection and Suppression – Hydrogen Compression

Project Reference Number

NIA_NGGT0196

Project Licensee(s)

National Gas Transmission PLC

Project Start

October 2022

Project Duration

0 years and 11 months

Nominated Project Contact(s)

Peter Martin Box.GT.Innovation@nationalgrid.com

Project Budget

£88,449.00

Summary

This project shall focus on the development of a conceptual design for a fire and gas detection and suppression system that has the capability to respond and protect compressor and cab infrastructure in the event of a safety incident in a Hydrogen compressor station. This design shall be input into an overall design of a full compressor package that shall be tested with Hydrogen at the FutureGrid facility to build a safety case for Hydrogen compression and test the capability.

Third Party Collaborators

Cullum Detuners Limited

Nominated Contact Email Address(es)

Box.GT.Innovation@nationalgrid.com

Problem Being Solved

The NTS provides a resilient supply of natural gas to homes, businesses and industry across the UK, and we aim to provide the same capability for hydrogen. The compression system on the NTS consists of 24 compressor stations and 70 individual compressor units. The compression system is needed to move the gas where it is required, depending on energy demand.

Reliable gas leak detection, fire detection and fire suppression systems are critical to protect against fire-related incidents at compressor stations. These systems cannot be repurposed for use with hydrogen and hydrogen blends, and new systems will require development.

Method(s)

Work Package 1: Requirements Development & Technology Review

Work Package 1 (WP1) of the project will develop the requirements for gas detection, fire detection and fire suppression systems for variable hydrogen blend compression. A technology search will be undertaken on current solutions on the market and the identified technologies assessed for demonstration.

Work Package 2: Concept Development

Work Package 2 (WP2) of the project will develop the conceptual design of the gas detection, fire detection and fire suppression system for the HyNTS Compression demonstration.

Work Package 3: Reporting

Deliver high quality, robust and relevant Technical Report and ENA Closure Reports to meet National Grid's requirements.

Measurement Quality Statement

The measurement approach used to meet Data Quality objectives will be through the identification of high calibre project partners whom are experts in their given field and the use of real data and materials from National Grid sites. In this instance the project will be demonstrations to inform new insights into the use of sensor systems to detect, locate and quantify fugitive emissions of Natural Gas and Natural Gas/Hydrogen blends, as well as pure Hydrogen. The installation of these sensor systems on National Grid operational sites and the FutureGrid test facility shall follow all relevant safety assessments and procedures, with the test procedures designed to quantify the required variables during demonstrations in order to prove the success and viability of the solution.

Data Quality Statement

The project will be delivered under the NIA framework in line with OFGEM, ENA and NGGT internal policy.

Data produced as part of this project will 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.

Scope

The scope of work contained in this project includes:

· Technology review of hydrogen and hydrogen blend gas detection, fire detection and fire suppression systems on the market – capable of meeting safety requirements in a compressor cab that could potentially contain Natural Gas, any Natural Gas / Hydrogen Blend and also pure Hydrogen

· Requirements for a hydrogen ready system

· Design of a gas and fire detection and fire suppression system to feed into the HyNTS Compression project

· Final technical report for submission on ENA portal

Objective(s)

· To determine the technical requirements for an effective gas detection system in a hydrogen / hydrogen blend compressor cab

· To determine the technical requirements for an effective fire detection and suppression system in a hydrogen / hydrogen blend compressor cab

To develop a combined gas and fire detection and fire suppression system conceptual design to feed into the HyNTS Compression project (Beta phase to begin July 2023)

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

The project shall be deemed successful if the final technical report outlines a thorough technology landscape assessment that can be easily digested to understand the advantages and disadvantages of each technology. Also, a final conceptual design will have been produced that can be taken forwards into a future innovation project to successfully fabricate such a system for testing in a Hydrogen environment.

Project Partners and External Funding

Gas Network – National Grid Gas Transmission

Cullum – Engineering Consultancy

Potential for New Learning

There will be increased understanding of what the current landscape is for fire and gas safety device development and appropriateness for Hydrogen environments. The other key learning point will be the development of a conceptual design that can then be applied to the wider HyNTS compression project, allowing the complete design and construction of a complete Hydrogen compression unit for testing. The learnings from this project shall be shared through the smarter network portal, as well as through direct engagement with any other gas networks that could benefit from the results.

Scale of Project

The scale of this project and investment is appropriate for the learning and benefits that will be received through all the project deliverables. The technology review and conceptual design development could not be completed on any smaller scale without potentially compromising on the quality of the outputs.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

United Kingdom

Revenue Allowed for the RIIO Settlement

None – Hydrogen network focused project

Indicative Total NIA Project Expenditure

£88449

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:

It will develop a conceptual safety system design that can support future Hydrogen network compression, by enabling a safer environment within compressor cab infrastructure. For a Hydrogen network we will require compressor units that are capable of compressing Hydrogen/Hydrogen blends, therefore we will also need accompanying safety systems, such as a Hydrogen compatible fire and gas detection and suppression system.

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

It is challenging to quantify the benefits for this project, as they shall be safety related. Through the design of a robust gas and fire detection and suppression system for Hydrogen, there shall be increased confidence that the safety risk associated with compression of Hydrogen and Hydrogen blends can be reduced. This not only helps reduce the risk to operational personnel but also reduces the risk of damage to compressors, that are critical to maintaining supply on the National Transmission System. This project, among all other Hydrogen related projects, will help build the safety case for the operation of a high pressure Hydrogen network.

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

The conceptual design produced in this project could potentially be applied to any compressor station in the UK that is going to be operating with Hydrogen or Hydrogen blends, and therefore compressing Hydrogen.

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

N/A – This Project does not intend to rollout anything, but knowledge and information generated through the conceptual design from the project. Consideration of utilising the gas and fire detection and suppression system beyond the project in future testing shall form part of the final report.

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

Whilst the system designed within this project will be specific to compression related operational activities, the concept of fire and gas safety design for Hydrogen networks can be translated into other activities carried out by other network licensees.

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.

There will be no duplication of activities done as part of this project. As the transmission operator, National Grid are in the unique position of operating rotating machinery and therefore compressor cab infrastructure. The work done in this project to help identify a conceptual design for a fire and gas detection system will interact with the HyNTS Compression SIF project by feeding into an overall Hydrogen compatible compressor conceptual design.

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

There are not currently any Hydrogen/Hydrogen Blend specific compressor infrastructure in place on a transmission network in the UK. This project will result in the conceptual design of a novel fire and gas detection and suppression system that has not been used before, and eventually will be tested in a Hydrogen environment in a future innovation project.

Relevant Foreground IPR

This project and the resultant outcomes/deliverables will conform to the default treatment of IPR as set out under the agreed NIA Governance (where the default requirements address two types of IPR: Background IPR and Foreground IPR).

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

There is currently no part of the NTS that transports Hydrogen, therefore any project work identifying possible fire and gas detection systems for a Hydrogen compression environment would not be suitable as part of business-as-usual activity, instead benefitting a future Hydrogen network. It is therefore relevant for NIA funding.

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

As mentioned, the result of this project will only benefit a future Hydrogen compression system, as there are already well established fire and gas safety systems in place for a Natural Gas network. Therefore using NIA support helps to develop a conceptual design that can eventually be used in a compressor build for a live test environment in Hydrogen, something completed at risk.

This project has been approved by a senior member of staff

☑ Yes