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 2019

Project Reference Number

NIA_SGN0156

Project Registration

Project Title

Hydrogen Gas Detection Instrument

Project Reference Number

NIA_SGN0156

Project Licensee(s)

SGN

Project Start

October 2019

Project Duration

2 years and 0 months

Nominated Project Contact(s)

Mark Wheeldon

Project Budget

£158,000.00

Summary

The UK Government's target to reduce greenhouse gas emissions by 80% of 1990 levels by 2050 requires the gas networks to explore alternative options for heat. Hydrogen has become an attractive alternative to natural gas because it does not emit carbon when combusted.
SGN are involved in a number of research and development projects associated with hydrogen ranging from transmission down to low pressure distribution. Before we can demonstrate that these hydrogen projects are viable, a leak detection instrument that can detect hydrogen at the same levels natural gas is required. The leak detection instrument is a critical safety feature to managing and operating a gas network.

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

The Gas Distribution Networks (GDN's) are working on a number of projects investigating the feasibility of hydrogen distribution to support the UK governments carbon reduction target of net zero by 2050. A conversion from natural gas to hydrogen presents an interesting opportunity to meet this target whilst maintaining security of supply and minimising disruption to customers (when compared to an electrification of heat). Hydrogen when combusted produces water and oxygen as by-products which eliminates the carbon emissions currently produced from combusting natural gas.

SGN's H100 project aims to demonstrate the safe, secure and reliable distribution of hydrogen to people's homes in a chosen site in Scotland. To construct and operate the 'first of a kind' hydrogen network with the same level of safety as we have new equipment will need to be developed. In particular a new hydrogen gas detection instrument will be needed. This is an essential piece of equipment used in the gas emergency process for locating gas escapes.

A review of currently used gas detection instruments and their suitability to detect hydrogen has been completed through the H100

project however, it identified that currently certified gas detectors do not give accurate readings for when detecting hydrogen. Therefore, there is a need to develop/reconfigure a portable gas detection instrument so that it is suitable for detecting hydrogen at levels ranging from 0-100% Gas in Air, 0-100% Lower Explosive Limit and ppm.

Method(s)

SGN have partnered with GMI to further develop the GMI GS700 gas detection instrument into a multi gas instrument capable of detecting hydrogen as well as natural gas. The new GS700 platform developed by GMI for SGN under a previous NIA has the capacity for an additional hydrogen sensor to be added that will enable the detection of hydrogen gas.

1. The project will begin with a review of previous work done in the area of hydrogen gas detection.
2. The supplier will incorporate the new sensor technology along with the necessary modifications to the GS700 leak detection instrument and tested against the ranges specified in the standards 0>100% Gas in Air, 0>100% Lower Explosive Limit and ppm
3. The prototype will be performance tested, verified and certified to the relevant standards (ATEX, EMC, INQ and BS Standards)
4. The supplier will develop training material and user documentation for the instrument
5. Field trails will be conducted to further test the performance of the certified instrument.

Scope

The project will develop, test and produce prototype gas detection instruments suitable for detecting hydrogen. A hydrogen detection instrument is critical to SGN's H100 project to demonstrate hydrogen distribution networks can be built, operated and maintained just as safely as current natural gas networks.

Objective(s)

The objectives of this project are to

- Investigate sensor technologies that will detect hydrogen.
- Develop test and certify the prototype detector against relevant standards
- Produce user documentation and training guide for the gas detection instrument
- Further test the gas detection instrument in a field trail

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The success criteria for the project are as follows:

- Identify a suitable sensor that can be fitted to the existing GS700 gas detection instrument
- Develop, test and certify the prototype against industry standards
- Field trail assessments deem the gas detection instrument suitable for detecting hydrogen at ranges specified in the relevant standards (0>100% GIA, 0.100%LEL and ppm)

Project Partners and External Funding

The project will be led by GMI

Potential for New Learning

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

- a new hydrogen gas detection instrutment certified and tested to industry standards
- a training guide and user documentation

Scale of Project

The development of a hydrogen gas detection instrument will be small scale at first, being used solely for the SGN H100 hydrogen demonstration network. But can be rolled out to the wider GB for any subsequent 100% hydrogen networks.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

Scotland for the H100 demonstration trial.

Revenue Allowed for the RIIO Settlement

none

Indicative Total NIA Project Expenditure

The total project expenditure is £158,000.

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)

Conversion to hydrogen has been reported to be less costly than conversion to electricity. Hydrogen gas detection instruments will be a key safety feature on new hydrogen networks.

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 gas detection instrument can be utilized across GB for hydrogen projects and field trials

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

Not applicable as there are not hydrogen networks yet.

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

Subsequent hydrogen demonstration networks will require a functioning hydrogen leak detection instrument for emergency and operational procedures.

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

n/a

☑ 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.

A review has been made of all other Network Licensees and no other similar projects have been carried out

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

Research into existing hydrogen gas detection instruments has found that there is no instrument available on the market that can accurately detect both natural gas and hydrogen, a requirement for a transitioning industry from natural gas to hydrogen.

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

Hydrogen distribution networks are not yet Business as Usual activities. Therefor the development of a hydrogen detection instrument would not be required nor benefit the Network Licensees in the current price control.

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

A market for hydrogen gas detection instruments is yet to be established. Through utilizing the NIA funding there is an opportunity for interested parties to use the output from the project for any subsequent hydrogen distribution projects and/or trials.

This project has been approved by a senior member of staff

☑ Yes