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

Apr 2024

Project Reference Number

NIA2_SGN0061

Project Registration

Project Title

Assessment for Suitability of Ventilation for Boiler Compartments

Project Reference Number

NIA2_SGN0061

Project Licensee(s)

SGN

Project Start

March 2024

Project Duration

0 years and 6 months

Nominated Project Contact(s)

Joshua Ayobami

Project Budget

£78,700.00

Summary

This project aims to assess the recommendations for ventilating boiler compartments containing hydrogen boilers. These recommendations are based on extensive experimental and computational modelling developed through various technical projects. However, the requirements are impractical as the recommended type and size of vents are not readily available. The project will strive to optimize these requirements to accommodate standard vent sizes wherever possible. Updating the venting requirements will subsequently facilitate the safe adoption of hydrogen for domestic use, particularly in properties where boilers are situated in cupboards.

Third Party Collaborators

Kiwa

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

SGN has engaged Kiwa, one of our technical suppliers, to provide recommendations where other industry hydrogen standards such as IGEM/H/2 have fallen short. The Kiwa recommendations, alongside the Hy4Heat safety annex is forming the basis for the technical conversion aspects of the H100 trial and will work as a source material for the development of training material for the engineers who will carry out the hydrogen conversion. Kiwa has advised on requirements for compartment ventilation which is based on wider experimental data and computational modelling they have developed through the various technical projects they have undertaken. Unfortunately, the requirements are impractical as the type and size of vents recommended are not readily available.

The problem to be addressed by this work is therefore simply to further assess this recommendation and where possible, optimise the requirements so that market available vent types and sizes can be used.

Method(s)

This technical research project aims to evaluate and improve ventilation requirements for compartments housing hydrogen boilers. It will collect data on how standard vent sizes affect the dispersion of buoyant gas within a cupboard or compartment containing a hydrogen boiler and assess their effectiveness in case of an unexpected escape.

The methodology for addressing this issue involves conducting a market review and measuring the free space area of standard vent sizes. Additionally, a test program will be implemented, involving the release of helium in compartments at various leak rates to simulate a hydrogen escape. This will help evaluate the effectiveness of different vent styles in reducing gas concentrations within the space.

Scope

SGN has received a recommendation for potential vents for boiler compartments, suggesting a free area of 125 cm^2. However, initial market research revealed that vents with this specific free area are challenging to find readily available. As a result, Kiwa will conduct a comprehensive market review to identify relevant vents currently on the market and assess their free area. Once suitable vent styles are selected, a testing program will be initiated to evaluate their effectiveness in ventilating cupboards or compartments housing hydrogen boilers.

During this testing phase, helium releases will be utilized to simulate hydrogen escapes, allowing for an assessment of the effectiveness of various vent styles in reducing gas concentrations within the compartment. Measurements of helium concentrations within the compartment and the adjacent room will be taken for different leak rates, providing insights into the performance of the identified vents from the market review. The conclusions of the test will be provided in a detailed report. Task within this work package will be:

- Review of market available vents and purchase of a selection of potential options.
- Measure free area of these potential vents.
- Test work with different vent sizes (free area variation).
- Provision of results regarding suitable products (inc. product reference numbers).
- Report writing.

Objective(s)

The aim of this project is to evaluate the recommendations for ventilating cupboards housing hydrogen boilers and refine the requirements to accommodate standard vent sizes. This optimization will streamline the conversion process to hydrogen.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

A successful trial has the potential for the role out of hydrogen as a form of energy for heating to those currently not connected to the gas grid. This could mean those financially not able to use natural gas to heat their home may be able to with hydrogen. The outcomes of the project will not adversely affect vulnerable customers but feeds into a wider piece of work to decarbonise the gas network. Other projects will explore how vulnerable customers will not be left behind on this journey.

Success Criteria

The success criteria for the project are the delivery of the following:

- Design and safe execution of a test programme of helium releases in Compartment using standard vent sizes.
- Optimizing ventilation requirements to enable the use of standard vent sizes.
- Provision of findings concerning suitable products (including product reference numbers).

Project Partners and External Funding

Kiwa and SGN.

Project wholly funded through NIA.

Potential for New Learning

The project will evaluate the efficiency of standard vent sizes for ventilating compartments housing hydrogen boilers, contributing to the development of a safety case. Kiwa will deliver comprehensive insights in a detailed report summarizing the findings.

Scale of Project

A comprehensive understanding of the ventilation effectiveness of standard vent sizes for application in hydrogen boiler compartments is crucial for facilitating the H100 Fife Neighbourhood trial, thereby justifying the magnitude of the investment.

The recommendations from this work would in turn facilitate the development of training materials for the engineers responsible for the hydrogen conversion process for H100.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

The test programme will take place at Kiwa laboratory, Cheltenham. The project will be representative of the whole GB network.

Revenue Allowed for the RIIO Settlement

Not Applicable

Indicative Total NIA Project Expenditure

SGN External – £78,700

SGN Internal – £26,207

Total – £104,907

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:

This project is a vital enabler to the Hydrogen Neighbourhood trial, which has a considerable benefit in facilitating the energy system 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 (this is a research project)

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

The intention is for this project to be relevant and therefore replicable to hydrogen trials, usage and deployment within domestic properties of any size.

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

This project aims to refine ventilation requirements for hydrogen boiler compartments and propose appropriate standard vents. The insights gained can benefit any network planning to transition its end user connections to operate on hydrogen. Findings from the project will be available to all relevant stakeholders through the ENA Smarter Networks Portal at https://smarter.energynetworks.org/

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.

This project will build on previous work in this area and has been discussed with key stakeholders (i.e. DESNZ) to ensure there is no duplication of work. The findings from the project will be shared with all key stakeholders.

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 is a crucial facilitator for the H100 Fife Neighbourhood trials, a highly innovative programme unparalleled in scale and replication elsewhere in the world.

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

The hydrogen Neighbourhood projects and any of the associated enabling projects, cannot be considered as BAU due to their first of a kind nature and risks which go beyond BAU.

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 NIA framework offers a robust, open framework to support this work and ensures the results are disseminated to all licenses. The conversion of the GB gas network to 100% hydrogen is a key step on the road to net zero.

This project has been approved by a senior member of staff

☑ Yes