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 2022

Project Reference Number

NIA2_SGN0019

Project Registration

Project Title

Retrofit Excess Flow Valves (EFVs)

Project Reference Number

NIA2_SGN0019

Project Licensee(s)

SGN

Project Start

May 2022

Project Duration

1 year and 3 months

Nominated Project Contact(s)

Innes Maciver

Project Budget

£226,660.00

Summary

The project will look to procure and test a number of excess flow valves (EFVs) and determine their suitability for use with 100% hydrogen networks. To comply with the Hy4Heat QRA there is a requirement to install an EFV in every hydrogen service either within the service pipe or immediately after the ECV. For new service installations as part of the H100 neighbourhood trial, the EFV will be installed at the junction of the service pipe and the main at the outlet of the tapping tee as an electrofusion fitting. This project will also look at other options for installing the EFVs including after the emergency control valve (ECV) as a mechanical threaded fitting and inserted into the service pipe using a catheter-type tooling technique.

Third Party Collaborators

Kiwa

Synthotech Limited

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

The UK government has committed to reducing greenhouse gas emissions to net zero by 2050 with the Scottish government targeting net zero by 2045. All future energy modelling identifies a key role for hydrogen in providing decarbonised energy for heat, transport, industry and power generation. Significant decisions on the future of UK heat policy are expected from the UK government in 2026 so the need for further evidence to influence these decisions is of critical importance.

In order to comply with the QRA developed as part of the Hy4Heat project and adapted following findings from H21 phase 1 and 2 work, the H100 neighbourhood trial and all future trials must have an EFV installed in the service pipe or immediately after the ECV as

one of the key safety features. EFVs are widely available in the marketplace but there are no products currently certified for use on 100% hydrogen networks. This project will look to address this problem.

Method(s)

The project will be split in 3 main phases, outlined below:

Phase 1 – EFV lab testing programme (Kiwa)

· Agree the products and installation options to be tested.

· Source a sample of a minimum of 3 models of EFV for testing.

· Construct the test rig to accommodate the EFVs procured.

· Undertake the test programme using hydrogen considering the following: -

- Vary supply pressures from 25 to 75 mbar to represent the low pressure (LP) distribution range.
- Measure the pressure drop across the EFV against the flow rate.
- Record the flow rate at which the EFV operates to isolate the flow.
- Record the flow rate of hydrogen through the EFV bypass orifice.
- Fully close the gas supply using isolation valve and allow EFV to reset.
- Re-open isolation valve and record the volume of gas released before EFV isolates flow.

· Review the results and how they compare with the requirements of the hydrogen EFV standard IGEM/H/PRS/1.

· Prepare a draft report explaining the results for discussion prior to producing a final report.

· Draft a letter to IGEM to advise them of any updates required to the hydrogen EFV standard to improve its applicability to reducing risk.

Phase 2 – Gas escape modelling (Kiwa)

· Consider the concentration of gas reached at steady state following releases into representative rooms.

· Consider the effect of the real operating points of EFVs as well as the EFV functionality included in hydrogen smart meters.

Phase 3 – EFV Tooling and Techniques (Synthotech)

· Market review and industry consultation of available EFVs and appropriate tools/techniques for insertion into PE service pipe.

· Develop tests for chosen products and undertake required testing programme.

· Review the findings and prepare a report.

· Develop a new or adapt an existing retrofit EFV, technique and tooling for use with hydrogen.

Measurement Quality Statement

The main approach of the project will be to identify and test EFV products currently available on the commercial market for use with 100% hydrogen. A test rig representative of a gas service pipe will be constructed by our contracting partner to undertake a suite of tests to confirm the suitability or otherwise of a number of sample EFVs. This is important as it will allow SGN to demonstrate the suitability and operability of this key safety feature.

Data Quality Statement

Regular meetings will be held with key stakeholders from each network and the suppliers to agree the format for the sharing and storage of project data. Kiwa and Synthotech's involvement in the project will ensure a consistent approach in the presentation of the evidence and data due to their involvement in previous EFV projects and their knowledge of insertion techniques for PE services.

Scope

The scope of work involves identifying a selection of a minimum of 3 no. sample EFVs from existing products available on the

commercial market. In the first phase this will concentrate on EFVs that are either installed as electrofusion fittings in the PE service or after the ECV as a mechanically-threaded fitting. Phase 3 will focus on EFVs that can be inserted into the PE service pipe. In order to test their effectiveness with 100% hydrogen, a bespoke test rig will be constructed complete with PE service pipe, an ECV and an EFV with a flow meter for measuring gas flow, pressure sensors for measuring differential pressures and a needle valve for setting the flow. Undertake a testing programme using 100% hydrogen to demonstrate the effectiveness of the various samples of EFV.

The second phase of the project will involve a series of gas escape modelling using the two-vent model of gas dispersion to consider the concentration of gas reached at steady state following releases into theoretical rooms representing four combinations of room volume and air tightness. This will also consider the effect of real operating points of EFVs as well as the EFV functionality included in the hydrogen smart meters.

Objective(s)

The main objectives of the project are to certify a number of EFVs for use with 100% hydrogen for both trials and eventual adoption for the entire gas network post conversion. The idea will be to scope an electrofusion fitting, a mechanically threaded fitting and, if possible, an EFV for insertion into an existing service pipe.

This will allow the H100 Fife trial and all future village trials to proceed incorporating this key safety feature and meeting the requirements of the QRA.

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 key success criteria of the project include:

- A number of EFVs approved and certified for use on 100% hydrogen networks.
- Effective gas escape modelling to detail the reduction in risk of using EFVs.
- A revised industry standard fit for purpose going forward and an agreed specification for EFVs.
- An effective method of installing EFVs in existing service pipes and a hierarchy of the various options.

Project Partners and External Funding

Kiwa, Synthotech and SGN.

Project wholly funded through NIA

Potential for New Learning

This project will specify a number of suitable EFVs for use with 100% hydrogen and appropriate techniques for retrofitting these into existing services.

Scale of Project

This project will be a combination of lab testing, industry research and gas escape modelling. The project will assess up to 3 different products for their compatibility with 100% hydrogen to ensure there is a reasonable commercial market for EFVs for trials and following conversion.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL9 Operations

Geographical Area

The project will aim to be representative of the whole of the GB network.

Revenue Allowed for the RIIO Settlement

Not applicable

Indicative Total NIA Project Expenditure

SGN External – £200,000

SGN Internal – £26,660

Total – £226,660

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:

EFVs are a critical safety element for upcoming 100% hydrogen trials and any future network conversion to hydrogen. This project will assist with the energy system transition through enabling project trials to commence with an effective EFV installed in the service therefore complying with existing Hy4Heat QRA. It will also assist with the progression towards village trial and full conversion through providing options for retrofitting EFVs.

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

There is a lot of work ongoing to identify the most effective route to achieve the net zero targets set by the UK and Scottish governments and this project is one of the many that will look to evidence the role of converting the existing gas networks to 100% hydrogen can play. In order to repurpose the existing UK gas networks to 100% hydrogen, a key safety feature will be the installation of EFVs to limit the flow within the customer's premises. Converting the UK gas networks to 100% hydrogen has the potential to save millions of pounds with minimal gas customer disruption versus alternative decarbonisation solutions.

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

The project will analyse commercially-available equipment and techniques for retrofitting EFVs so will be replicable across GB networks. The project will consider electrofusion EFV fittings and EFVs installed after the ECV as mechanically-threaded fittings. It will also investigate existing tools/techniques for inserting EFVs in PE service pipes.

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

The costs will be minimal as an industry standard will stipulate the requirement for the EFV and the only cost will be to procure and install the EFVs.

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 will identify suitable EFVs for use with 100% hydrogen trials and determine the best option for installation of EFVs to reduce the risk to as low as practicable. Phase 1 of the project will allow a suitable EFV to be installed for the neighbourhood trial H100 Fife. 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 the other networks 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.

Not applicable

Additional Governance And Document Upload

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

There are currently no approved EFVs for use with 100% hydrogen. This project will identify suitable EFVs for use with 100% hydrogen and determine the optimum location for installing the EFV to reduce the risk.

Relevant Foreground IPR

Not applicable

Data Access Details

Information relating to the project will be published on the ENA Smarter Networks Portal at https://smarter.energynetworks.org/

Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

This project isn't being funded as business as usual because it is deemed an essential part of the 100% hydrogen trials process which is a key step towards conversion of the existing gas network to 100% hydrogen.

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