

NIA Project Registration and PEA Document

Date of Submission

Jul 2019

Project Reference Number

NIA_SGN0154

Project Registration

Project Title

Hydrogen Excess Flow Valve

Project Reference Number

NIA_SGN0154

Project Licensee(s)

SGN

Project Start

August 2019

Project Duration

2 years and 1 month

Nominated Project Contact(s)

Mark Wheeldon

Project Budget

£130,000.00

Summary

In order to meet the UK governments plants of net zero by 2050 there is a need for no carbon heat. Hydrogen for heat provides an opportunity to meet the challenging target while minimizing disruption to customers and therefor, is an attractive alternative to natural gas.

SGN's H100 project aims to demonstrate hydrogen can be distributed safely to people's homes. To ensure the highest level of safety on this 'first of its kind' hydrogen network, Excess Flow Valves will be installed on every service of the network to avoid risk of hydrogen build up in buildings.

Excess Flow Valves are an essential safety feature within the gas network designed to close and stop gas flow if the service, meter or internal pipework suffers a catastrophic failure. Stopping the flow of gas from a damaged service significantly reduces the risk of a fire, explosion, injury and/or property damage.

Through SGN's H100 project the EFVs currently used on natural gas services were tested for suitability with hydrogen. The project identified that the higher flow rates of hydrogen caused the EFV to 'trip' erratically and therefor deemed them unsuitable.

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

In order to meet the UK governments plants of net zero by 2050 there is a need for no carbon heat. Hydrogen for heat provides an opportunity to meet the challenging target while minimizing disruption to customers and therefor, is an attractive alternative to natural gas.

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This project will form part of H100's demonstration network.

Method(s)

SGN partnered with HSL to conduct the first phase of testing, which was to test natural gas EFV's for suitability with hydrogen as part of the H100 project. HSL have now been awarded phase 2 of the project to develop a suitable EFV for 100% hydrogen. Awarding to HSL will reduce costs by utilizing the existing methodology and test rig built to run the original Emergency Flow Valve tests.

1. The project will begin with a review of the current Gas Industry Standard for Emergency Flow Valves: GIS:EFV1:2006 and conduct gap analysis.
2. With the gaps identified, a new standard will be developed and also a specification.
3. Once the specification and standard are developed, a new prototype EFV can be produced and tested against the standard and specification.
4. A report will be produced outlining the outcomes of the tests.

Scope

The project aims to develop, test and produce prototypes EFV's for use on hydrogen services that operate at pressures up to 75mb. This is safety by design feature of the H100 demonstration network and an additional requirement for services on this network only.

The requirement is for a hydrogen low pressure EFV but currently the only applicable gas industry standard is for natural gas excess flow valves that operate at medium pressure (75 > 2000mbar) so therefore neither the standard nor the existing EFV is suitable for use with hydrogen. HSL together with their partners IGEM and AVR will develop a new standard then build and test prototype low pressure excess flow valves for the H100 network to that standard, workflow as follows;

- A review of current EFV standard and specifications
- Develop requirements and new standard
- Design and manufacture prototype hydrogen EFV
- Test against new specification
- Approve for use

Objective(s)

The objectives of this project are to:

- Develop a new Gas Industry Standard and specification for a hydrogen excess flow valve.
- Industry approval of the new standard
- Development of a prototype EFV that has been tested against the new standard and meets the criteria set out in the specification
- Final report outlining the outcomes of the tests

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The success criteria are as follows:

- Detailed final report for publication
- New Gas Industry Standard for Hydrogen Excess Flow Vales
- New Specification for Hydrogen Excess Flow Valves
- Prototype hydrogen Excess Flow Valve that has been tested against the new standard and designed to the new specification.

Project Partners and External Funding

The project will be led by Health and Safety Laboratory and supported by subcontract partners AVR UK and IGEM

Potential for New Learning

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

- A new standard for Low Pressure hydrogen excess flow valves
- A new specification for Low Pressure hydrogen excess flow valves
- The development of a suitable hydrogen excess flow valve suitable for futures hydrogen distribution networks

Scale of Project

Phase 1 will be the development of a prototype hydrogen EFV suitable for use on SGN's new H100 demonstration network supplying approximately 300 properties. Phase 2 will look to develop EFV's for retrofitting to existing networks / services that have been converted to 100% hydrogen.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

The outputs from this project are UK scalable and will be applicable to all newly constructed 100% hydrogen networks.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

The total project expenditure is £130,000

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)

Studies have shown a conversion to hydrogen is considerably less costly than conversion to electricity. Excess Flow Valves will be a key safety feature on the 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 developed Emergency Flow Valve can be used for any future low pressure hydrogen network

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

Will not be rolled out to natural gas networks, only future hydrogen networks

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

Hydrogen for heat has become an attractive alternative for delivering low carbon heat. A certified excess flow valve suitable for hydrogen flow rates can be used by all GDN's for new hydrogen network. The project will support the roll out of hydrogen distribution networks to meet UK targets of net zero carbon by 2050

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 of the ENA smarter networks portal has revealed no duplicate projects. And since this is first of a kind project EFV's for hydrogen are not currently available.

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

Hydrogen is being considered as a viable alternative to natural gas however there are still technical aspects to be investigated. Excess Flow Valves suitable for the higher flow rates associated with hydrogen have not been developed yet as safe hydrogen distribution has yet to be proven. SGN's H100 demonstration will be the first of its kind and will have excess flow valves on every service. This is a safety by design feature and only applicable to the H100 demonstration.

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 networks are not yet Business as Usual activities. Therefor development of a hydrogen excess flow valve would not 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 commercial market for hydrogen excess flow valves is not yet established, however through utilising NIA funding, there is an opportunity for interested parties to use the output from the project to develop hydrogen distribution networks as the developed Excess Flow Valves will available.

This project has been approved by a senior member of staff

☒ Yes