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

Jun 2023

Project Reference Number

NIA_NGN_350

Project Registration

Project Title

Smart Gas Pressure Sensor

Project Reference Number

NIA_NGN_350

Project Licensee(s)

Northern Gas Networks

Project Start

September 2023

Project Duration

0 years and 6 months

Nominated Project Contact(s)

JKnott@northerngas.co.uk

Project Budget

£198,960.00

Summary

In the event of an incident on the network, pressures may reduce to a level that could affect the security of supply for wider consumers and/or the delivery of gas at a satisfactory pressure to consumers. In extreme conditions this could mean the network pressure is so low that the end-user supply needs to be isolated for safety. The process to re-establish the supply is time-consuming and can be onerous on consumers and networks. To mitigate this, we will create a device that can detect low-pressure and/or unacceptable rate of change in pressure at consumers properties. Once a change is detected the device will be able to activate a shut-off valve. The valve closure will isolate the end-user gas supply, protecting the end-user and the wider network. Development of a solution at this point will allow for availability of a monitoring solution that can be deployed along with the network rollout of hydrogen supply.

Third Party Collaborators

DefProc Engineering

Nominated Contact Email Address(es)

innovation@northerngas.co.uk

Problem Being Solved

In the event of an incident on the gas distribution network, pressures in the system could reduce to a level which could affect the security of supply for wider consumers and/or the delivery of gas at a satisfactory pressure to consumers meters. In extreme conditions this can mean network pressures reach such a level at which it must be isolated for safety. The process to re-establish the supply is a time-consuming process and can be onerous on consumers and network operators. This is because each property must be visited on numerous occasions and potentially requires the network, service, internal installation pipework and consumer appliances to be re-tested, purged, and re-commissioned.

This challenge may be more prevalent in a high hydrogen use future, as hydrogen is initially introduced into the network for instance

through the Hydrogen Village Trials (HVTs) as the production and supply of hydrogen will be novel and less mature, potentially leading to lesser resilience and concerns regarding continuity of supply. Although this risk is significantly low in likelihood, the need for gas distribution networks to provide engineering solutions to prevent increased safety risk is still present.

Trials and initial role out will be reliant on local production and storage rather than national infrastructure, therefore, supply events could be more reasonably expected in the outset.

Method(s)

To mitigate this risk, this project seeks to create a device which can detect a low-pressure and/or an unacceptable rate of change in pressure at consumers properties. Once a change like this is detected, the device should then be able to activate a shut-off valve which will close the gas supply and assist in ensuring the wider network is protected. Although this would result in the consumer losing their supply, the overall restoration of
supply following an isolation of the home by a Gas Safe registered engineer (and possibly the consumer themselves) is much less disruptive than a potential multi-day cessation of supply. It will also reduce the overall number of consumers losing supply by minimising the demand requirement on the overall network.

Scope

Our approach to this challenge would consist of using a mechanical under-pressure shut off, similar to those already available, but to instrument that with the digital pressure sensor, LoRaWAN radio and a state monitor of the lockout valve. However, similar to the previous H2Go project, the beginning would involve some trials whereby other approaches (eg. electrically operated valves) will be reviewed. This will allow all possible directions to be considered and ensure DefProc configures the best engineering decision possible for the device.

Objective(s)

Phase 1: To verify the most appropriate system design to meet the monitoring and reporting of pressure and under-pressure shut-off (UPSO) conditions. DefProc will then carry out tests in their lab before bringing a proof-of-concept device to test with hydrogen supply.
Phase 2: To take the learnings from phase 1 to build prototype devices which best meet the Networks needs and requirements of the deployment situation. At the end of this phase, the resultant devices will be ready for wider deployment, subject to network need, and any mandatory testing for devices to be attached to the network.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

Significant benefits for customers in vulnerable situations can be expected, however over a long term horizon. The project aims to develop an initially low level TRL solution that will enable safe and secure supply of low carbon gases to consumers in domestic settings. This will dramatically improve safety implications associated with issues with continuity and stable flow of gas to a consumer, e.g. pressure problems/no gas scenarios.

Success Criteria

The project will be determined a success if the devices that are able to be demonstrated to stakeholders to showcase the possibilities of the future of network protection. This includes the construction and testing of 5 prototype devices capable of achieving the desired outcome, passing lab testing of both the build quality and design intention.

Project Partners and External Funding

Northern Gas Networks (Lead Network Partner)
DefProc – Project Delivery Partner

Potential for New Learning

With the introduction of more mitigation measures when it comes to poor pressure incidents, we can establish new learning and advancements in technology to both protect the networks and reduce disruptions to customers.

Scale of Project

The first phase of the project is constrained to lab build and test, to provide demonstrator capable devices as the end product. The second phase will include the application of the devices on to a live test-site that is not connected to the live network. The demonstrators are to be utilised as a method of engaging stakeholders on the possibilities of varying protections that could be utilised

to protect the network in the case of poor pressure through a number of causes.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

The project will take place within DefProc's Lab in North West England and a live Hydrogen test site at Low Thornley. No interaction with the live network will take place.

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

NGN External Costs: £99,960
NGN Internal Costs: £33,320
Total Project Costs: £133,280

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:

The devices in question, that would be the end product of the project, are envisioned to be able to provide further mitigation and safety for our customers in a hydrogen future scenario and will be able to push forward the networks in their use of smarter devices to protect the network

How the Project has potential to benefit consumer in vulnerable situations:

In addition to the benefits of the project's end products as above, the devices built would provide more assurance and ability to protect vulnerable customers supplies.

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)

N/A

Please provide a calculation of the expected benefits the Solution

The device to be developed will lead to less interruptions to customers and more stability in supply and prevent issues in the future by identifying areas with potential network supply restrictions previously unknown. At this time, accurate cost benefit analysis is not possible, this is due to a number of variables and future risks, including the future UK Gov policy decision on hydrogen use in residential settings. It is however anticipated that this solution could significantly mitigate safety hazards associated with uncontrolled supply of hydrogen within domestic settings, delivering significant societal benefit.

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

It is anticipated that this solution can directly support the upcoming GD2 Hydrogen Village Trials (HVT), providing an immediate roll out value of 2,000 properties. If successful and a high use hydrogen future policy decision is taken, then the solution could be rolled out across all GB GDNs.

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

Indicative costs per unit are not currently available.

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

With the introduction of more mitigation measures when it comes to poor pressure incidents, we can establish new learning and advancements in technology to both protect the networks and reduce disruptions to customers

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

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.

Studies of the SmarterNetworksPortal and of the various Gas Distribution Networks projects portfolios have been undertaken, as well as engagement with manufacturers into every aspect of this technology with nothing being brought to our attention as delivering what the project and potential product could deliver.

If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

Northern Gas Networks is current undertaking an NIA Funded Project Titled, “IoT Pressure Sensor Pilot” (NIA_NGN_303), the key difference between both projects is that this project (NIA_NGN_303) aims to provide a solution primarily for a hydrogen future scenario, to provide additional level of safety for downstream consumers.

Additional Governance And Document Upload

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

Currently no technology exists that meet the needs of this project. The project aims to bridge gaps between existing devices by leveraging network expertise and the current landscape of IoT (Internet of Things) and communication pathways.

Relevant Foreground IPR

No Relevant foreground IP apparent. Standard NIA IPR arrangements will be followed.

Data Access Details

For more information, please see https://www.northerngasnetworks.co.uk/wp-content/uploads/2018/03/Innovation-Data-Sharing-Policy.pdf

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

As this is leveraging new and emerging technology, not yet in use for Gas Distribution networks, some discovery is necessary to understand how impactful these technologies can be.

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

To mitigate and manage the risk of the unknown when it comes to R&D of this project and the potential solution, utilising the NIA is very applicable, especially due to the benefits that could be realised upon the project's success to both networks and consumers.

This project has been approved by a senior member of staff

☑ Yes