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

Feb 2014

Project Reference Number

NIA_SGN0020

Project Registration

Project Title

Novel Pressure Reduction Station (Stage 1)

Project Reference Number

NIA_SGN0020

Project Licensee(s)

SGN

Project Start

January 2014

Project Duration

2 years and 1 month

Nominated Project Contact(s)

Mark Skerritt, Innovation Project Manager

Project Budget

£90,568.00

Summary

The scope of the project includes:

- Defining what a pressure reduction station should and could achieve
- Reviewing and assessing new and current technologies for pressure control and energy recovery/storage
- Developing concepts and agreeing a scope of technical requirements
- Producing a high level design assessment including analysis of potential devices, sizing, performance and economic factors
- Producing a feasibility report including recommendations and preparing detailed design requirements and costing proposals for a potential follow on project to advance the TRL of this Method.

Upon successful completion of this work, SGN will determine whether further research and development, which would include full system design, prototype testing and field trials, would have sufficient benefits to justify further stages.

The Project has had to be extended by 5 months, concluding in January 2016. Additional time has been required by the Project Partner, The University of Strathclyde, following the identification and selection of the new potential system. This is an important but complex process as the system must meet SGN requirements. As a result, it was important for the purposes of the testing for SGN to provide the Project Partner with a full suite of information and data, including pressures, flows and power usage to charge a data logger for a typical site etc. The Project Partner has now established how the technology and results will affect the GDN requirements in relation to the original problem definition. They are now able to progress to the next stage and continue as planned.

This will enable the off-site trials to be completed at the University, provide time for an assessment of the technology and proposed equipment which will benefit the accuracy of the Project outcome and implementation recommendations.

This highlights the importance of determining the technical aspects of the Project at an earlier stage, in this case it was necessary for an additional 5 months for the designs to be clarified. Another lesson learned from this is the importance of communicating with the

university on a regular basis to ensure that they are engaged and understand the Scope of the Project.

By confirming the applicable test are performed against the original scope the proposed technology could be applied to the networks and benefit in the outcomes of the Project. The change is needed to allow the Project to progress to a successful conclusion and the benefits to be realised. There is no change to the expected benefits or cost of the Project. The change is needed to allow the Project to progress to a successful conclusion and the benefits to be realised.

The Project title, problem, objectives, success criteria and cost arrangements as previously outlined in the original PEA document will remain unchanged.

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

SGN has a high percentage of below 7 bar pressure reduction stations that are over 30 years old and operate in harsh environmental conditions across our Scotland and Southern licence areas.

The decision to replace or modify a pressure reduction station is based on many different criteria, the most important of which is safety, followed by security of gas supply. When existing stations are assessed for capacity or compliance against gas standards and policy documentation, they may be deemed not to meet the required criteria and ultimately require upgrading or replacement. While repair of stations would generally be
the preferred least cost option, this is not always possible as many of the key components of these installations such as the regulator and slam-shut valves ceased production some 10 to 15 years ago with the result that only limited spares are now available. This can force the replacement of many pressure reduction stations due to obsolescence.

In the case where a replacement is proposed the cost can be considerable, as it is important that the installations are planned, designed, constructed and maintained safely, using the most effective methods, materials and techniques presently available. The basic concepts adopted for pressure control in the gas industry have not changed or been challenged in many years, despite many advances in technology.

Considerable energy is presently lost in network pressure reduction, in an ideal design this energy would be recoverable and noise pollution reduced. The design and physical size of the pressure reduction station impacts on the selection of potential sites, purchase and use of land, and environmental restrictions.

There is potential for significant improvement in the design of replacement pressure reduction stations. As a result, this project aims to investigate a radically novel pressure reduction station design.

Method(s)

This project is concerned with exploring a new solution to regulate pressures below 7 bar in a more efficient and cost effective manner, and also reduce ongoing maintenance costs.

A novel pressure reduction system design would incorporate processes to prevent gas at higher pressures entering a downstream system, have sufficient capacity, minimal maintenance requirements, would limit the size of the construction area required and would seek to harness the energy released through pressure reduction and minimise the need of preheating prior to pressure reduction.

The benefits expected would be a reduction in the time operatives spend on site, improvements in safety and security of supply, and environmental improvements through energy efficiency and impact on land usage.

This project is a feasibility study that will involve SGN collaborating with the University of Strathclyde Department of Mechanical and Aerospace Engineering to undertake a detailed technical and economic
assessment of currently available devices that can simultaneously recover energy and control pressure starting from basic engineering principles without preconceived constraints that will develop an innovative concept for pressure reduction.

Scope

The Scope of the Project includes:

- Defining what a pressure reduction station should and could achieve
- Reviewing and assessing new and current technologies for pressure control and energy recovery/storage

- Developing concepts and agreeing a scope of technical requirements
- Producing a high level design assessment including analysis of potential devices, sizing, performance and economic factors
- Producing a feasibility report including recommendations and preparing detailed design requirements and costing proposals for a potential follow on project to advance the TRL of this Method.

Upon successful completion of this work, SGN will determine whether further research and development, which would include full system design, prototype testing and field trials, would have sufficient benefits to justify further stages.

The Project has had to be extended by 5 months, concluding in January 2016. Additional time has been required by the Project Partner, The University of Strathclyde, following the identification and selection of the new potential system. This is an important but complex process as the system must meet SGN requirements. As a result, it was important for the purposes of the testing for SGN to provide the Project Partner with a full suite of information and data, including pressures, flows and power usage to charge a data logger for a typical site etc. The Project Partner has now established how the technology and results will affect the GDN requirements in relation to the original problem definition. They are now able to progress to the next stage and continue as planned.

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Objective(s)

The objectives of this study are to:

- Review current global technologies for energy recovery, pressure control and energy storage that can meet the elements of the complete performance specification.
- Analyse potential devices, sizing, performance and economic factors.
- Determine the most advantageous device/s to be integrated in new pressure reduction system design
- Delivery of a feasibility report that provides recommendations for future development.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The success of this project will be reviewed against the following criteria:

- The identification of new potential devices and techniques.
- Evaluate the benefits and limitations of the new devices.
- The identification of the device/s which could provide the greatest benefits.
- Establishing the level of energy which can be potentially be recovered or recycled through different techniques.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

This project has been designed initially to carry out a technical feasibility study. It was deemed appropriate to limit this project to a relatively small scale study because of the low technology readiness level. SGN have chosen not to commit to funding a larger scale project until feasibility has been established.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

This project will be undertaken at the University of Strathclyde, Glasgow, Scotland.

Revenue Allowed for the RIIO Settlement

During RIIO-GD1 it is estimated that SGN will spend approximately £53.1m on the replacement of pressure reduction stations. As this project is a feasibility study for a technology at a low TRL, it is not yet possible to determine whether revenue savings are likely during RIIO-GD1. However it is believed that if progressed successfully through to development and field trial this method will have the potential to enable cost savings in replacement of pressure reduction stations.

Indicative Total NIA Project Expenditure

The total eligible NIA project expenditure expected to be £90,658, 90% of (£81,592) is Allowable NIA expenditure.).

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)

As this project focuses on a feasibility study of new technologies it is difficult to quantify the potential financial benefits at this stage.

It is envisaged that a novel pressure reduction station concept would lead to the following financial benefits based on the following areas:

- Reduction in installation costs.
- Reduction in maintenance activities.
- Reduction in preheating costs through energy recovery.

In addition this project has the potential to also deliver non-financial benefits including:

- Improved safety and security of gas supply.
- Reduced environment impact by deploying quieter and physically smaller installations.

Please provide a calculation of the expected benefits the Solution

N.A. This is a research project.

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

This project is designed to reduce the cost of pressure reduction stations. SGN have approximately 772 installations which could potentially be affected by the successful outcome of this project. It can be assumed that the other networks also have a large collective number of sites across Great Britain (GB) that this method could ultimately apply to if future stages are progressed following the success of Stage 1.

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

There are minimal costs associated with sharing the conclusions and recommendations of this feasibility study with other Network Licensees, which will be the first step towards rollout across GB. As stated above, the very early technology readiness level means that it is not possible to estimate the costs of deployment at this stage.

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

All Network Licensees will be able to use the learning generated as the outcomes of the feasibility study will be mpresented in a clearly defined report that focuses on providing possible solutions to address the objectives. This study will compare the current global technologies for energy recovery, pressure control and energy storage that can meet the elements of the complete performance specification. Network Licensees will be able
to use the conclusions and recommendations to determine whether future stages in the development of this technology could provide benefits that outweigh the costs and disadvantages of current methods of pressure reduction stations.

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.

n/a

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

n/a

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

n/a

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

n/a

This project has been approved by a senior member of staff

☑ Yes