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

Mar 2017

Project Reference Number

NIA_SGN0106

Project Registration

Project Title

Strategic Pipeline Heat Study

Project Reference Number

NIA_SGN0106

Project Licensee(s)

SGN

Project Start

March 2017

Project Duration

1 year and 8 months

Nominated Project Contact(s)

Keith Ellison, Innovation Project Manager

Project Budget

£240,803.00

Summary

The strategic heat study will seek to evidence how to optimise our alarm, control and operating philosophies to increase energy efficiency, reduce unnecessary call outs and potentially eliminate the requirement for lagging.

Many of our sites have preheating systems installed to manage the Joule-Thomson effect from pressure reduction. There are a significant number of alarms and faults associated with preheating control systems. If we can optimise our control systems we hope to be able to eliminate unnecessary callouts and increase reliability and efficiency of these systems.

Following the introduction of the SGN/PM/CM/4 inspection process, significant corrosion has been identified at over 300 locations within above ground asset sites, a significant number of these were identified under lagging. To understand if the lagging is required it is necessary to understand the heat loss associated with the system.

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

The Immersion tube pre-heating project at Lochmaben (NIA_SGN0002) identified heat losses associated with the system that could be rectified and efficiency of the system improved, thus removing unnecessary call outs to site.

Many of our sites have preheating systems installed to manage the Joule-Thomson effect from pressure reduction. There are a significant number of alarms and faults associated with preheating control systems. If we can optimise our control systems we hope to be able to eliminate unnecessary callouts and increase reliability and efficiency of these systems.

The most common call out related to heat loss of preheat is heavily influenced by the flow conditions and where the sensor is located. The strategic heat study will provide an improved methodology based on factors including sensor location, the present of lagging and other heat losses would result in a reduction in call outs.

Significant corrosion has been identified under lagging. Inspection of pipework under lagging presents a greater challenge than other inspection activity due to the need to remove and replace. Ideally the pipelines would not require lagging and primary protection through standard coating systems would suffice.

The majority of PRS's have a low pressure change across the site and operate at ambient temperature therefore lagging will not be required. SGN specification for thermal insulation of above ground pipework and equipment (SGN/SP/PWC/2) states pipework containing pre heated gas over 10oC should be lagged. To understand if the lagging is required we need to understand the heat losses associated with the system. A heat loss study will be conducted for 8 sites which quantify the heat losses associated at each site. Using the results from the strategic heat study a decision tool will be developed which will determine if the process can still work without lagging and quantify the heat loss with or without lagging as a percentage of the yearly consumption.

Method(s)

- Quantified heat losses associated with a range of sites. Gather 100% useable data from at least 8 SGN sites. The analysis can be applied to the remaining network.
- Gap analysis and risk assessment and gap analysis of relevant industry and SGN standards and specifications.
- Develop software/excel spreadsheet for lagging decision support tool. The tool will determine the heat losses associated with or without lagging as a yearly percentage consumption.
- Revision of existing SGN policy documentation with corporation of findings.
- Completed technical report on results, findings and comparisons between new and existing elements.
- Provide technical report on detailing fault reduction benefit option for SGN to optimise the alarm, control and operation philosophies and how the analysis can be used across the network.

Scope

The strategic heat study will seek to evidence how to optimise our alarm, control and operating philosophies to increase energy efficiency, reduce unnecessary call outs and potentially eliminate the requirement for lagging.

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Objective(s)

The objectives of this project are to:

- Quantify the heat losses associated with at least 8 SGN sites; a range in heating systems, location, pressures etc.
- Develop a decision tool to determine whether lagging is required.
- Improve philosophies to overcome false indications of preheat asset failures and reduce call outs in response to low station exit temperature alarms.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The success criteria for this project is to seek evidence how to optimise our alarm, control and operating philosophies to increase energy efficiency, reduce unnecessary call outs and potentially eliminate the requirement for lagging. The project will be determined to be a success if the following is achieved:

- Quantified heat losses associated with a range of sites.
- Develop software/excel spreadsheet with user guide for lagging decision support tool.
- Revision of existing SGN policy documentation with corporation of findings.
- Completed technical report on results, findings and comparisons between new and existing elements.
- Provide technical report on detailing fault reduction benefit option for SGN to optimise the alarm, control and operation philosophies and how the analysis can be used across the network.
- Share the learning of this project with the other Network Licensees.

Project Partners and External Funding

None

Potential for New Learning

This project is expected to provide all Network Licensees with a fundamental understanding of heat losses associated with a range of heating systems, pressures, locations etc. This will improve philosophies and reduce unnecessary call outs and understand the requirement for lagging without compromising the integrity of the pipe work.

SGN aims to disseminate the learning from this project via technical report.

Scale of Project

In order to ensure that learning associated with this project is maximised and that the heat losses determined are well understood, it is necessary to trial a good selection of sites across SGNs network. The visits will allow SGN to assess the benefits of this innovative project and deliver learning as outlined above.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL6 Large Scale

Geographical Area

All visits will be carried out at SGN sites across Scotland, Southern and South East England networks.

Revenue Allowed for the RIIO Settlement

This is a high cost activity, for the remainder of RIIO-GD1 it is currently estimated that SGN will spend a further £17m on unnecessary call outs and repairs of corrosion under insulation.

Indicative Total NIA Project Expenditure

The total predicted project expenditure is £240,803, 90% of which is recoverable under NIA expenditure (£216,724).

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)

It is expected that if successful this project could provide Network Licensees with an opportunity to make cost savings on unnecessary call outs and repairs. Therefore provide net financial benefits to customers, as a result of the improvements made to the existing method of maintain the integrity of the pipework and equipment.

Please provide a calculation of the expected benefits the Solution

Base cost: SGN have reviewed the closed faults for a month's period and approximately 80 days were associated with heating and temperature alarms. 30% could potentially be overtime hours (Saturday – Sunday). Assuming 84 days per month for winter months and no jobs for summer months, this would equate to approximately £250,000 of operational labour time per annum. This would be £2,000,000 in the next 8 years.

In additional to the above significant corrosion has been identified under lagging, lagging is comprising the integrity of the pipework. Since the significant corrosion under insulation has been identified there has been 8 epoxy shells installed in Scotland. Preliminary conditioning monitoring (CM4) surveys have identified a high number of defects requiring repair due to corrosion under lagging. Using the data collected from CM4 surveys the number of repairs required over the next 8 years has been estimated. This equates to over more than £1,000,000.

Method cost: value of project, it is envisaged SGN and other networks will have an operational tool to determine heat losses without significant work to be carried out.

Cost Benefit for the next 8 years:

£2,000,000 + £100,000 - £240,803 = £1,859,197

Cost Benefit per annum: £232,400

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

This project has been designed to develop potential solutions to clearly defined industry challenges. Therefore, it can be assumed that this project shall provide Network Licensees with the opportunity to transfer the benefits of the optimising alarm, control and operational philosophies and reducing corrosion under lagging.

It can also be assumed that each network has a similar number of unnecessary call outs. Based on a 4:2:1:1, the potential saving could be as follows:

National Grid = £464,800

Northern Gas Networks = £116,200

Wales & West Utilities = £116,200

Overall the total saving across GB per annum could be in the region of £929,600

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

It is anticipated that the cost of disseminating the development outcomes and findings from the project and training costs incurred before the software can be used would be approximately £7,500 for SGN. Based on a 4:2:1:1 the estimated total cost of training before the equipment can be used operationally throughout GB would be £30,000.

This estimate is based on the following assumptions: Four training courses for 6 people are provided for each Network Licensee from the project partner.

It is anticipated that thereafter each Licensee would have their internal training departments carry out further training once the initial training program from the project partner to a selective proportion of their workforce has been carried.

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

The learning from this project will benefit Network Licensees as it will provide them with a clear evaluation of quantified heat losses. If successful the learning from the project will allow network licenses to make informed decisions on whether they would like to adopt our new proven philosophies and lagging decision tool.

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

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☑ 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 all other Network Licensees Innovation Funding Incentive (IFI) Annual Reports and NIA portfolios has been performed and no similar projects have been identified.

A similar review of current academic literature and journals has also been performed to avoid any potential overlap with the current project.

SGN have also engaged with the project partner and they have provided clarity that no unnecessary duplication of this project is currently being undertaken in GB that they are aware off.

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