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 2019

Project Reference Number

NIA_SGN0145

Project Registration

Project Title

ACE (Advanced Condensing Exchanger) – Phase 2

Project Reference Number

NIA_SGN0145

Project Licensee(s)

SGN

Project Start

March 2019

Project Duration

1 year and 8 months

Nominated Project Contact(s)

Keith Ellison Innovation Project Manager

Project Budget

£353,138.00

Summary

SGN currently operates approximately 240 pre-heat assets where approximately 120 of these are rated below 200kW. One challenge faced by gas distribution networks is the lack of replacement options available where small scale preheat solutions are required. Current available options are limited to small-scale boiler houses which are complex resulting in higher call-out rates and have a shorter asset life.

A number of innovation projects have been carried out looking to improve efficiencies within our network. Recently completed NIA project carried out by ProHeat “Strategic Pipeline Heat Study (NIA_SGN0106)”, investigated the operation of several types of preheating technologies, and evidenced how to optimise our alarm, control and operating philosophies to increase energy efficiency, reduce unnecessary call outs and potentially eliminate the requirement for lagging.

This led to a further NIA project “ACE (Advanced Condensing Exchanger) (NIA_SGN0124)”, which investigated conceptual designs into ACE heaters which are efficient and easy to maintain, alternatives for both water bath heater and boiler house upgrades.

While the initial ACE heater Phase 1 concept (NIA_SGN0124) was targeted for application up to 50kW, it was identified through the Strategic Pipeline Heat Study (NIA_SGN0106) project that:

- The average installed pre-heat capacity for SGN is near 200kW.
- Sites with pressure cuts of <30 bar have, on average, half the total annual operating hours as compared to pressure cuts >30 bar, some operating as little as 300 hours per year.

Building on the learnings gained in Phase 1 of the ACE development (NIA_SGN0124), an additional project request has been included to review the feasibility of increasing the capacity of the original ACE to 240 kW while also developing ACE as a retrofit for older boiler house installations. These will be covered in two individual work packages (WP), WP1 ACE 240 Heater – Conceptual Design and WP2 ACE boiler House Retrofit – Conceptual Design.

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

SGN currently operates approximately 240 pre-heat assets where approximately 120 of these are rated below 200kW. One challenge faced by gas distribution networks is the lack of replacement options available where small scale preheat solutions are required. Current available options are limited to small-scale boiler houses which are complex resulting in higher call-out rates and have a shorter asset life.

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Method(s)

This project is concerned with the two conceptual designs of the new solutions for ACE 240 Heater and ACE Boiler House Retrofit.

WP1 ACE 240 Heater
This will involve carrying out a study and design of a larger ACE Heater capable of accommodating site duties up to 200kW. Ten potential application sites will be reviewed in order to develop a design which maximises standardisation. This project will allow wider implementation and approval of ACE as a product suitable for a range of duties across SGN and other GDN sites.

WP2 ACE boiler House Retrofit
This will involve a study and conceptual design of a boiler house retrofit option for replacement of older atmospheric boilers which lack redundancy. A retrofit proposal will be developed for Petersfield while five other sites with potential for application will be reviewed to maximise design standardisation.

This project will provide a basis for providing a simplified, industrial retrofit option for existing boiler houses reducing design and construction costs by reusing existing site infrastructure which remains in good condition and avoiding site re-design and re-reconfiguration to accommodate condensing boilers.
Key stages of the projects are as follows.

- Project Kick-Off
- Conceptual Design and Standards Review
- Client Review and Finalisation of Product Scopes
- Detailed Design Packages and PS/5 Package
- Final Reports

Scope

To conceptually design two new innovative solutions for Advanced Condensing Exchangers, WP1 ACE 240 Heater will involve carrying out a study and design of a larger ACE Heater capable of accommodating site duties up to 200kW. WP2 ACE Boiler House Retrofit will involve a study and conceptual design of a boiler house retrofit option for replacement of older atmospheric boilers which lack redundancy.
Each ACE design has been proposed with a focus on plant life of 20-30 years with reduced complexity, and standardisation to ensure suitability for a maximum of SGN sites. ACE has also been designed to provide the option of maintenance by SGN operations.

Objective(s)

The objectives of the project are to:

- Undertake conceptual design of ACE 240 Heater
- designed with a minimum of complexity such that existing SGN staff can resolve call-outs and undertake maintenance.
- Detailed Design Packages and PS/5 Package
- The proposed retrofit study for Petersfield will open a door for a 96% efficient boiler and provide cost-effective option to renew pre-

heat assets without unnecessarily adding to complexity.

- A custom manifold will also be designed to allow two new boilers to be integrated with the existing site hot water circulation pipework.
- ACE Boiler House Retrofit will identify which components can be reused while upgrading the site to improve efficiency and meet redundancy requirements in accordance with TD/13.
- Each ACE design has been proposed with a focus on plant life of 20-30 years

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The success criteria for the project will be reviewed against the following criteria:
ACE 240 Review Conceptual Design:

- 10 sample sites and nomination of trial site.
- Conceptual Design
- Detailed design and PS/5 Package
- Final report and fabrication budget

ACE Retrofit Conceptual Design:

- 6 sites reviewed for suitability
- Conceptual Design Petersfield
- Detailed design and PS/5 Package
- Final report and fabrication budget

Project Partners and External Funding

ProHeat Systems

Potential for New Learning

The Project is expected to develop the following new learning for Network Licensees.

- Awareness of an alternative solution available for pre-heating with a capacity up to 200kW
- Evaluation & limitations of existing solutions
- New learning on the potential to reduce the size of the construction area required for sites with a heating requirement of a capacity of capacity duties of up to 200kW
- Providing a simplified, industrial retrofit option for existing boiler houses
- Possibility to re-use existing site infrastructure which remains in good condition

Scale of Project

This project has been designed initially to undertake the conceptual designs. It has been deemed appropriate to limit this project to a small scale because of the low technology readiness level. SGN have chosen not to commit funding a larger scale project until full design and feasibility has been established and additionally the field trial of ACE 1.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

This project will be relevant to all the GDN areas

Revenue Allowed for the RIIO Settlement

SGN's RIIO Allowance for Repair activities is £209.6m. Given that the Project is successful and identifies that a number of the ace Units can be installed it is likely that there could, potentially, be a reduction in the repair and replacement expenditure and due to the anticipated life expectancy of the new units, although this will become clearer as the Project progresses.

Indicative Total NIA Project Expenditure

The total project expenditure is £353,138, 90% (£317,824.2) of which will be recovered via the NIA funding mechanism in line with the funding conditions.

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 conceptual design and a low starting TRL it is difficult to quantify the potential financial benefits at this stage.

Please provide a calculation of the expected benefits the Solution

As this project focuses on a conceptual design it is difficult to quantify the potential financial benefits at this stage.
It is envisaged that these novel ACE solutions would lead to the following financial benefits.

- Reduction in installation costs
- Reduction in maintenance activities
- Reduction in call-outs
- High thermal efficiency
- Compact flexible geometry to accommodate a range of applications
- Smaller foot print for sites

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

N/A Conceptual design

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

The learning from this project will be shared and the individual networks will be able to implement the learning form this project

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 gained from this project aims to inform Network Licensees of the potential of a new innovative solution to heating which will give the Networks alternatives to the current solutions available.

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 other Network License's IFI Annual Reports was performed prior to the start of this project and no similar projects were identified and other networks made aware of this project.
Upon project acceptance from Ofgem, we will publish details of this project on the public domain to ensure no unnecessary future duplication will occur.

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

Current available solutions require installation of either fully electric heaters or a boiler house, heat exchangers and telemetry packages which in some cases cannot physically be accommodated. Higher telemetry requirements, increased risk of faults and call-out add increasing burdens to the environment and asset owners. This project will enable the Networks to have alternative solutions for the new builds and site up grades that currently have WBH (waterbath heaters) or Boiler houses installed.

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

This project aims to address the limited solutions to available for heating the gas at Pressure Reduction Stations and these are novel solutions with a low starting TRL.

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 networks do not have the technical capability to or ease of access to the required information to undertake the project.

This project has been approved by a senior member of staff

☑ Yes