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 2018

Project Reference Number

NIA_SGN0124

Project Registration

Project Title

ACE (Advanced Condensing Exchanger)

Project Reference Number

NIA_SGN0124

Project Licensee(s)

SGN

Project Start

March 2018

Project Duration

1 year and 1 month

Nominated Project Contact(s)

Keith Ellison, Innovation Project Manager

Project Budget

£88,920.00

Summary

This project is concerned with the conceptual design of a new solution for ACE Compact Advanced Condensing Exchanger small capacity preheat installation using gas fired condensing bath heater the heat exchanger will facilitate a process arrangement whereby the heat exchanger can be mounted is such a way to ensure the coolest process fluid will be located at the bottom of the bath to maximise condensing performance while also significantly reducing plant footprint. The preferred stackable configuration would be the fisrst such design installed in the UK gas networks.

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

The UK gas networks have spent much of the last 20 years retiringa fleet of over 1,600 water bath heaters with more efficient assets which better refelct modern standards & efficiency. The first initiative for replacement of water bath heaters was led by a desire to reduce combustion losses which often account for 25-45% of fuel use. Over time the networks have adopted more complex modular boiler system which offeer higher standards of efficiency,but relativly high cost relative to short asset life. While these more complex & efficient systems have served to reduce energy intensity of preheating, the nature of current default options result in proportionally high cost for smaller installations. As preheat installations sized for 40kW more typically operate at only 10-15 kW adopting maximum complexity for small installations can be seen to offer little benefit relative to investment. Furthermore, where small Pressure Reduction Stations (TRS/PRS) require preheat upgrades, current available solutions require installation of either fully electric heaters or a boiler house, heat exchangers & telemetry packages which in some cases cannot physically be accomodated. Higher telemetry requirements, increased risk of faults and call-out add increasing burdens to the environment and asset owners.

Method(s)

This project is concerned with the conceptual design of a new solution for ACE Compact Advanced Condensing Exchanger small capacity preheat installation using a gas fired condensing bath heater the heat exchanger will facilitate a process arrangement whereby the heat exchanger can be mounted in such a way to ensure the coolest process fluid will be located at the bottom of the bath

to maximise condensing performance while also significantly reducing plant footprint. The preferred stackable configuration would be the first such design installed on a UK gas network. Also, beneficial to the environment as it is aimed at reducing fuel use and run time in primary heating of plant by up to 50%. Identify potential sites on the network and review process conditions which will allow detailed designs to be developedand ultimately fabricated for live field application in the network in a phase 2 project.
Key stages of the project are as follows.

- Project kick-off and definition of critical success factors during a workshop
- Front end engineering design
- Detailed design & PS/5 (G/17) Approvals
- E7 Standard review
- Final report

Upon successful completion of this work, SGN will consider a second stage 2 project that will include the manufacturing & field trial installation in one or more PRS sites, operational training for staff and data collection to ensure key performance requirements are acheived.

Scope

The conceptual design of a new innovative solution ACE Compact Advanced Exchanger small capacity preheat installation using a gas fired condensing bath heater the heat exchanger will facilitate a process arrangement whereby the heat exchanger can be mounted in such a way to ensure the coolest process fluid will be located at the bottom of the bath to maximise condensing performance while also significantly reducing plant footprint. The preffered stackable configuration would be the first such design installed on a UK network.

The ACE Compact Advanced Condensing Exchanger will be innovative for seven main reasons.

- Novel heat exchanger design using gas temperature to maximise condensing efficiency
- Compact flexible geometry to accommmodate a range of SGN applications.
- 50-70% reduction in space as compared to a modular boiler house for ease of installation
- Thermal efficiency between 88%-103% similarly to condensing boiler technology
- Ease of service - similarity to water bath to povide maintenance familiarity to operators
- Simplicity - few moving parts; reduced complexity to support fewer faults and call-outs
- Targeted 30% reduction in capital and operating cost compared to existing options

Objective(s)

- Undertake conceptual design of ACE Compact Advanced Condensing Exchanger
- A compact flexible geometry to accommodate a range of applications
- Detailed design & PS/5 (G/17) Approvals
- Thermal efficiency between 88%-103% similarly to a condensing boiler technology
- Targeted 30% reduction in capital and operating cost as compared to existing options
- Ease of service - similarity to water bath to provide maintenance familiarity to opperators
- 50-70% reduction in space compared to a modular boiler house for ease of installation

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

- Develop a list of candidate sites which have at least one or more of the following characteristics, more than one pressure cut with a single heater, An installed capacity of <50kW, A current electric heater installation
- A sample of 10 sites used to explore a range of design configurations to ensure the initilal designs have a maximum standardisation
- Detailed design & PS/5 (G/17) Approvals
- Thermal efficiency between 88% - 103% similarly to a condensing boiler technology
- 50-70% reduction in space as compared to a modular boiler house for ease of installation
- Final report
- Upon successful completion of this work, SGN will consider a second stage 2 project that will include the manufacturing & field trial installation in one or more PRS sites, operational training for staff and data collection to ensure key performance requirement are acheived.

Project Partners and External Funding

None

Potential for New Learning

- Awareness of an alternative solution availiable for pre-heating with a capacity of <50kW
- 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 capacityof <50kW
- E7 Standard review to ensure compliance with current European Standards

Scale of Project

This project has been designed initially to undertake the conceptual design. 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 to funding a larger scale project untill full design and feasibility has been established.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

- The project will be designed in London
- Meetings at SGN Officies

Revenue Allowed for the RIIO Settlement

Under RIIO-GD1 SGN have been allowed a total £218m for work to upgrade and improve the Local Transmission System, £18m of which will be specifically spent on replacing existing pre-heating systems. In addition to this, an allowance of £136.8m has been made to reduce the gas shrinkage in the network. Poor fuel economy of existing pre-heating systems contribtes significantly to gas shrinkage. While no savings on this expenditure are expected during project implementation, there is potential for this technology, if proved successful, to result in considerable future savings in the capital and operational costs associated with preheating, while improving durability and design life.

Indicative Total NIA Project Expenditure

The total eligible NIA project expenditure expected to be £118,548 of which 90% is Allowable NIA expenditure (£106,693)

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 it is difficult to quantify the potential benefits at this stage.
It is envisaged that this novel ACE, Advanced Condensing Exchanger would lead to the following financial benefits.

- Reduction in installation costs
- Reduction in maintenance activities
- Reduction in call-outs
- Thermal efficiency between 88% - 103%
- Compact flexible geometry to accommodate a rannge of applications
- Smaller foot print for sites

Please provide a calculation of the expected benefits the Solution

N/A Conceptual design

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

This project is designed to reduce the cost of small preheat installations <40kW. SGN currently have 43 installations which could potentially be affected by the successful outcome of this project. It can therefore be assumed that the other networks also have a large collective number of sites across Great Britain (GB) taht this project could ultimately apply to if the future phase 2 project is progressed following the success of this project

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

N/A Conceptual design

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 Newtwork Licensees will be able to use the learning generated as conceptual design of the proposed pre-heating solution and the outcomes can be shared in a final report. If the conceptual design is successful a Phase 2 project will be initiated to manufacture the units to trial on site. This new technology is anticipated to deliver savings in lifecycle costs to benefit networks.

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.

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