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

Dec 2023

Project Reference Number

NIA_NGN_431

Project Registration

Project Title

Vorte Heating Solution

Project Reference Number

NIA_NGN_431

Project Licensee(s)

Northern Gas Networks

Project Start

August 2023

Project Duration

0 years and 6 months

Nominated Project Contact(s)

lkirkwood@northerngas.co.uk

Project Budget

£74,500.00

Summary

The project aims to investigate the deployment of a vortex tube for the use within pressure reduction stations in NGNs network. The Vorte solution proposes a low-cost efficient cooling and heating platform that solves pain points in an environmentally friendly way for multiple applications. The solution generates desired temperatures using gaseous compositions or just ambient air.

Third Party Collaborators

Vorte Technologies Ltd

Nominated Contact Email Address(es)

innovation@northerngas.co.uk

Problem Being Solved

Decarbonisation, System Resilience & Customer Vulnerability

Existing gas pre-heating equipment has a significant CAPEX, ongoing OPEX (requires third party energy and/or combusts gas that could otherwise continue downstream), causes off gassing and generates emissions, a large footprint and requires regular maintenance and replacement parts.

As a result, pre-heating equipment contributes to:

- Ongoing operational costs incurred by NGN
- Higher operational costs being passed onto customers as part of the gas price

· Carbon emissions (particularly water bath heaters)

· A weaker system resilience compared to heating equipment that offers significantly reduced maintenance and replacement parts (reduced risk of failure and down time) ensuring greater continuity of supply

Method(s)

General

The following points outline how the project will meet data quality and measurement objectives, including the milestone objectives alligned to each of the 3 Work Packages. This is detailed to ensure the reliability, traceability and comparability of the measurements results.

Work Package 1: Pre-heating needs & requirements-

- Information gathering to establish performance and capability requirements for the VORTÉ system and understand conditions, parameters, site locations, costs, compliance requirements of existing gas pre-heating equipment
- Data gathered from NGN of PRS site locations will be analysed and compared against one another to develop the ideal locations for WP2

Work Package 2: VORTÉ system architecture, design & capability-

- Perform CFD analysis and detailed calculations with the data produced to create a VORTÉ system specification that determines projected performance, capability and costs
- In the CFD process the data captured can combine with the performances of the systems to be used as a bench mark for the systems performance

Work Package 3: Feasability report & business case-

- Comparison of data from WP1 and WP2 to demonstrate benefits of VORTÉ system compared with existing gas pre-heating equipment and to develop recommendations supported with a product road map for next phases of development with the purpose of being able to make an informed progression decision

Scope

In Scope:

- Internal & External (NGN) Stakeholder Engagement
- Utilisation of existing industry contacts and network groups
- Use of NGN property to facilitate stakeholder engagement workshops
- Access to key Subject Matter Experts within Northern Gas Networks & Industry Partners
- Application conditions, installation and specific bypass system requirement discussions
- VORTÉ system specification requirements, capability range and certification strategy

Out of Scope:

- Product development beyond system performance and projected capability determination
- Hardware testing and live Field Trials of solution
- Budget variation beyond agreed feasibility project funding arrangements
- Project Phase (2), (3), (4) & (5) project content

Objective(s)

1. Determine technical, compliance and installation considerations for deployment at an identified pilot site
2. Determine a VORTÉ system specification with projected performance/capability CFD data that can be progressed to design and development phase for pilot

3. Provide VORTÉ system cost / benefit analysis comparing CAPEX, installation and OPEX life costs with existing pre-heating equipment
4. Determine scope and scale of prototype development resulting in a pilot trial

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

- Decarbonisation of Gas Distribution Operations
- Potential to reduce supply interruptions
- Aligns with UK Net Zero ambitions

The solution will provide a more reliable and resilient network, with a reduction in maintenance required within Pressure Reduction Stations. The cost reductions in OPEX & CAPEX has the potential to drive down gas/electricity bill prices.

By assessing alternative solutions for pre heating there is the potential to reduce the amount of supply interruptions on the network. The solution doesn't require any 3rd party energy or own use gas, resulting in a reduction in costs which can be relieved onto the consumers.

Success Criteria

Minimum Criteria (Must and Should):

- **Must be less than existing gas pre-heating equipment deployed at the same pressure let down point-** Minimum 30% CAPEX cost savings
- **Must be less than existing gas pre-heating equipment deployed at the same pressure let down point-** Minimum 50% OPEX cost saving
- **The projected CFD data must demonstrate a temperature not less than minimum requirement-** Not less than +5°C

Desirable Criteria (Could):

- **CAPEX costs of VORTÉ system-** Cost / benefit calculation compared with existing pre-heating equipment
- **OPEX life costs of VORTÉ system-** Cost / benefit calculation compared with existing pre-heating equipment
- **Projected performance criteria of VORTÉ system-** Delivers minimum temperature requirement downstream of pressure let down for compliance requirements

Project Partners and External Funding

Vorte Technologies Ltd- Vorte Technologies Ltd- Product specification, documentation preparation, developing product IP, CFD analysis, calculations and comparison analysis.

External funding- £74,500

Potential for New Learning

The feasibility project will provide new knowledge into the system requirements, capability and viability of deploying this gas heating innovation enabling an informed progression decision.

Scale of Project

This project seeks to determine the feasibility of replacing existing pre heating solutions with the Vorte solution. Developing the understanding of an alternate heating solution that reduces TOTEX spending and reduces emissions from pressure reduction stations.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

This project will be limited to the North and North East of England within Northern Gas Networks geographical area.

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

External costs- £74,500

Internal costs-

Total costs-

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:

- Increased Gas & Electricity network resilience
- Decarbonisation of Gas Distribution Operations
- Potential to reduce supply interruptions
- Aligns with UK Net Zero ambitions
- Potential to drive down gas/electricity bill prices by reducing network operating costs.
- Reduced long term financial impact of net zero transition on consumers

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

- Increased Gas & Electricity network resilience
- Decarbonisation of Gas Distribution Operations
- Potential to reduce supply interruptions
- Aligns with UK Net Zero ambitions
- Potential to drive down gas/electricity bill prices by reducing network operating costs.

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 outcomes of the project will produce a better understanding of the benefits if this solution were to be viable and deployed onto the network.

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

Once this solution has been established and proven to be viable, there would be no obvious reason the same methodology could not be applied to the wider GB. Unlocking the potential to significantly reduce GDNs own use gases, use of 3rd party energy and reduction in emissions.

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

The cost of rolling out the method across the UK is unkown at this time as the project will finish at a TRL3, in order to outline a roll out cost further development would be required.

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 learnings from the project will be available for other Networks within the UK, the learnings will help provide insight into a zero emissions pre heating solution that has the potential to be deployed in each network.

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

Please demonstrate how the learning from the project can be successfully disseminated to Network Licensees and other interested parties.

NGN and Vorte will promote the project at conferences and forums, promoting the project, its outputs and key findings.

Please describe how many potential constraints or costs caused, or resulting from the imposed IPR arrangements.<

The project has been conceived and scoped to comply with the standard NIA IPR arrangements. Therefore, there are no additional costs and constraints that are expected to affect the project.

Please justify why the proposed IPR arrangements provide value for money for customers.

Deployment of technology background IPR and further development of this aims to significantly reduce the costs incurred compared to using current conventional heating technology and systems protecting customers paying excessively. Foreground IPR developed during the project relating to deployment aims to share the knowledge of how to deploy enabling availability to all, protecting customers paying excessively across the UK.

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.

Other projects that tackle alternative heating solutions have been reviewed and this project covers areas that haven't yet been explored.

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

No other application to my knowledge has been able to provide a solution to eliminate any external energy to be used for pre heating.

Additional Governance And Document Upload

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

A patent is pending covering the scope of the core VORTÉ technology. Through Vorte's prior art searches, we are not aware of available pre-heating equipment technology that can offer up to 100% OPEX cost savings, and, when connected to the pipeline utilising gas pressure can function in isolation replacing the need for existing heating equipment.

Relevant Foreground IPR

The project and the resultant outcomes/deliverables will conform to the default treatment of IPR as set out under the agreed NIA Governance (where the default requirements address two types of IPR: Background IPR and Foreground IPR)

Data Access Details

For all data access requests, please follow the guidance set out in Northern Gas Networks Innovation Data Sharing Policy. https://www.northerngasnetworks.co.uk/ngn-you/the-future/our-funding/

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

The project will be looking at a solution that is at a low technology readiness level that isn't ready for any deployment at its current state. The project will help with the viability of vortex tubes being deployed at Pressure Reduction Sites as a zero emissions solution.

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

This project is highly innovative that supports UK gas networks reducing their emissions and 3rd party energy usage in the act of pre heating. The solution still has a number of risks to overcome before anyting can be deployed into a live gas scenario.

This project has been approved by a senior member of staff

☑ Yes