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

Jun 2024

Project Reference Number

NIA_CAD0106

Project Registration

Project Title

Low Power Hot Water Phase II

Project Reference Number

NIA_CAD0106

Project Licensee(s)

Cadent

Project Start

July 2024

Project Duration

0 years and 10 months

Nominated Project Contact(s)

innovation@cadentgas.com

Project Budget

£136,574.00

Summary

GDNs currently have a licence condition to provide fan heaters & hot plates to customers in vulnerable situations during a gas outage to stay warm, heat water & food. However, some customers will not be able transfer the hot water to a bowl or sink to be able to wash or clean with.

Haydale's graphene ink-based heaters offer a potential low power usage solution to heat water in domestic premises when the gas supply is interrupted and can be easily adapted into different designs to deliver bespoke solutions for a wide range of customer requirements, so is of interest to Cadent and their challenge of providing hot water to their customers in vulnerable situations when their gas supply is interrupted.

Following on from Phase 1 of the project (NIA_CAD_0077) Haydale will develop the prototypes created and take the project through to optimisation in electronics, weight, and customer experience.

Preceding Projects

NIA_CAD0077 (1) - Low Power Hot Water

Third Party Collaborators

Haydale Composite Solutions

Nominated Contact Email Address(es)

Innovation@cadentgas.com

Problem Being Solved

GDNs have for many years had licence conditions (and GSOP requirements) to provide fan heaters & hot plates to PSR customers & those in vulnerable situations during a gas outage to help them stay warm. RIIO2 has seen the addition in the case of an incident of >250 households to also provide both hot water & hot food. For this requirement there are some market ready options available such as larger kettles and portable showers with a bucket however, many customers will physically struggle and potentially be at risk if trying to transfer hot water to a bowl or sink to be able to wash or clean with.

With Cadent's awarded Customer Value Proposition (CVP) we have committed to go further than our GSOP requirements and provide alternatives to reduce risk and improve the situation for those customers with additional needs and hot water provision is a clear priority for certain health conditions and other vulnerable situations. Not only is hot water a priority to help keep our customers safe, warm and independent in their homes but current options are expensive to use in the home as they rely upon high wattage electricity and too many large kettles (or other electrical items) also puts the electricity network at risk when numbers increase. They are also generally intrusive, heavy and not easy to use. Additional cost to the customer to use alternative power to heat water has also been considered.

Method(s)

Haydale's graphene ink-based heaters offer a potential low power usage solution to heat water in domestic premises intended in this instance for when the gas supply is interrupted and can allow Cadent to meet their challenge of ensuring customers are safe, warm and independent in their own homes and providing alternatives to current provisions in these instances.

This method will aim to develop upon the learnings found in Phase 1 of the project and provide two prototypes, one for use in the kitchen and one for use in the bathroom, for a potential commercial solution, that currently does not exist within the market, to enable customers in vulnerable situations to heat water, be able to wash and clean and allow them to live independently.

Data Quality Statement

The project will ensure that necessary data is of sufficient quality and readily available to meet the objectives of the project. This will be achieved by providing current relevant PSR data, to enable development to progress in the correct manner.

Measurement Quality Statement

The project will utilise data directly from the PSR , only that is relevant and proportional to the project, as well as utilising data that has been captured by Haydale in a separate project. This data will be reviewed with the wider project team regularly to ensure transparency and consistency.

Scope

Haydale's graphene inks can be printed onto a variety of substrates, either rigid or flexible, they are conformable and flexible. They can be tailored for bespoke solutions to operate at a variety of resistivities and powers and so offer a wide range of options to deliver solutions across a variety of different and varying use case scenarios.

The overall scope, broken into 3 main stages, is the Engineering development of Low Power Hot Water – Inclusive of bringing ideas and concepts to conducting prototype development. This will be achieved by;

- Stage 1 Specification and Outline design - Outline the detailed product specifications for optimizing the 2 units from prototype to real world manufactured units. Take into consideration input from all stakeholders and external user groups.

- Stage 2 Product and Production design - This will include detailed mass production design, preliminary suppliers and BOM list, Material cost estimation, Manufacturing cost estimation, lightweighting, design review and sign off with full detailed report.

- Stage 3 Sample build - 1 of each unit to be produced. Parts sourcing, test and modify, testing and verification on 2 units, demonstration and sign off with full final report.

Objective(s)

Stage 1

A detailed report outlines key optimization points.

A design strategy, including high level CAD on how the design will address optimization.

An outline on how environmental and sustainability requirements will be met.

Stage 2

Detailed Design Review will be presented detailing the design details and effectiveness in meeting the key functional parameters.

The target BOM (Bill of Material) will be listed with rough Order Magnitude on cost of materials and manufacturing cost.

A manufacturing process flow will be presented detailing the manufacturing process and assembly process.

Stage 3

Minimum of 2 working units with appropriate safety and conformance certification will be delivered. The developed pre-product prototypes will be trialled and validated in an operational environment along with a detailed report of all work undertaken and any test results, modelling, and designs.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

This project has been input into the Consumer Vulnerability Impact Assessment Tool and there are no negative impacts on consumers in vulnerable situations therefore there is no need to take mitigation measures.

Success Criteria

- The LPHW units should heat up to a set temperature for hygiene purposes and dispense in a practical safe way.
- They should be powered by a rechargeable battery.
- Consideration must be taken to recyclability.

Project Partners and External Funding

The project partner for this project is Haydale and the project will be wholly funded via NIA.

Potential for New Learning

Utility companies will develop a better understanding of requirements for customers in vulnerable situations when they are off gas and the current alternative heat sources do not apply, due to their particular needs around requiring hot water to enable them to wash and clean with.

All reports will be published on the ENA Smarter Networks Portal.

Scale of Project

The project will be delivered as detailed and will bring significant advances relating to alternative heat sources in Off Gas situations and their effect / impact on consumers in vulnerable situations. If the scale was lessened, it would significantly reduce the benefit received from the project.

Technology Readiness at Start

TRL5 Pilot Scale

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

The project is development based and is applicable to Cadent's four Networks.

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

Total external costs: £125,000

Total internal costs: £11,574

Total NIA expenditure: £136,574

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:

This project will aim to deliver further, two prototypes for alternative water heating in off-gas situations, which will have been designed and be ready to test in an operational environment. The product will aim minimise disruption to customers in vulnerable situations. There are many beneficiaries of the project – including both PSR customers and those in vulnerable situations; by being provided with a safe method to heat water in their homes during gas interruptions. We estimate that this initiative has the potential to reach approximately 300,000 people who have experienced disruptions over RIIO-GD2 and this innovation has the potential to positively impact other situations beyond our works including wider civil contingencies not limited to the UK.

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 aim of the project is not necessarily to see financial benefits but to improve the experience of customers in vulnerable situations and potentially the wider public when they are in an off-gas situation. In addition, the project could provide the following benefits:

- Financial – Printed heaters could be mass manufactured using reel to reel production method and thoroughly encapsulated for longer service life.
- Health and safety - Smart control system will ensure safer operation of each unit.
- Community - Vulnerable population less likely to be affected by gas outage.
- Customers - Uninterrupted heating solution.

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

Project reporting will quantify the scale and cost of the opportunity of implementation taken from this project.

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

Roll out cost are not within scope as the end TRL level is 7

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 this project could be adopted by other Network licenses. However, the cost and methodology to roll this is out have not yet been developed

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

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 thorough check has been completed and no similar projects have been identified. All networks were informed of the project via a project notification form on huddle and no issues of duplication have arisen.

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

Low Power Hot Water has not been identified previously across all GDNs and thus makes this project innovative.

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

Any consumer data gathered throughout this project will be anonymised and will be compliant with General Data Protection Regulations (GDPR) and the UK Data Protection Act. Any compliant data can be made available for review upon request.

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

The scale of the issues at hand is unknown and therefore there is a high level of uncertainty associated with the project which would be beyond the network licensees' risk appetites. This piece of work is to better understand the opportunities for alternative heating methods when customers are off-gas.

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 high-level risk associated with the low TRL project is beyond the current risk appetites of networks. NIA will allow us to complete this project to better inform future decisions and opportunities.

This project has been approved by a senior member of staff

☑ Yes