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 2024

Project Reference Number

NIA_CAD0100

Project Registration

Project Title

HVT Appliance Development – Phase 1

Project Reference Number

NIA_CAD0100

Project Licensee(s)

Cadent

Project Start

October 2023

Project Duration

0 years and 3 months

Nominated Project Contact(s)

Michael Sinclair

Project Budget

£162,000.00

Summary

The primary activity within this project is the drafting of ITTs (Invitation to Tender) for the development of the various hydrogen appliances that will be required to enable a successful village trial in Redcar (due to deploy in 2025/26). This will involve the collation and interpretation of all survey data, from both domestic & non-domestic properties in the Redcar trial area, before detailing the variance and volume of hydrogen appliances required – and transferring this into formal ITTs.

A secondary activity will be the planning of the full 'Phase 2' programme, which would involve oversight of a ~2 year development programme.

The project is split between Cadent (as appointed leads of the collaborative appliance working group) and NGN (as leads of the Redcar village trial).

Nominated Contact Email Address(es)

Innovation@cadentgas.com

Problem Being Solved

The UK has mandated that it shall reach Net Zero emissions no later than 2050. The UK was the first major world economy to set this target and it shows the UK's commitment to tackling climate change for future generations. This mandate has put the UK on an accelerated programme to reduce emissions across our entire society whether this is industry, transport, agriculture, or the way we create our power and heat our homes.

To achieve Net Zero by 2050 will require a co-ordinated effort across the whole of the economy and by individuals who will be required to make technology choices and potentially change habits and behaviours to live more sustainable lives.

In line with this, in July 2021, Ofgem and BEIS published a joint letter inviting the GDNs to submit applications to Ofgem for funding to

support the detailed design stage of the village trial. BEIS ran a consultation (Hydrogen for heat: facilitating a grid conversion to hydrogen heating trial) between August and September 2021. Following supportive responses from stakeholders, the government confirmed its intention to proceed with the proposed legislative amendments required to facilitate hydrogen heating grid conversion trials, alongside measures to strengthen consumer protections for those in the trial area.

In July 2023, the government announced that the Redcar trial (run by NGN) would remain in consideration to proceed to Stage 3 (Prepare & Build) of the trial.

The Redcar village trial aims to convert a large village of around 1,800 domestic properties & 200 commercial businesses to hydrogen for heating instead of natural gas. Led by NGN, it will trial the conversion of existing gas network infrastructure in the local area, repurposing it for 100% hydrogen.

This will involve replacing consumers' natural gas appliances with hydrogen-compatible equivalents, making any other adjustments required to properties, and piping hydrogen to premises for the trial period through the existing natural gas network, which will be appropriately modified to ensure it can safely transport hydrogen.

There are several collaborative workstreams within the wider 'Collaborative Annex' of the Hydrogen Village Trial (HVT) programme – where all GDNs work together to address common areas that apply to any future trial – such as safety, training, and appliance development. Throughout Stage 2 (Detailed Design) it become clear through the HVT Appliance Supply Chain work, and engagement with OEMs in the Appliance Working Groups (AWGs), that there is not currently the level of development or diversity of hydrogen appliances required to meet the consumer demands of the HVT. Further appliance innovation investment is therefore required (on top of the outputs from Hy4Heat and H100) to ensure that an adequate suite of hydrogen appliances is available to meet the consumer demands of the Redcar HVT programme.

The current natural gas appliances within the Redcar trial area need itemised first, before technical specifications for their hydrogen equivalents can be confirmed for inclusion in ITTs (Invitation to Tender), which could then be shared with OEMs (Original Equipment Manufacturers).

Method(s)

This activity/service is purely desk-based, with Arup completing 'Phase 1' over 3 months – this is the upfront work that can be carried out in readiness for the full appliance procurement and development programme (Phase 2).

Phase 1 is made up of:

• Phase 1a – ITT Development

• Phase 1b – PMO Design (running in parallel) to set up the management structure and processes for the eventual procurement and development programme.

Arup were commissioned in July 2022 by SGN, as part of Ofgem's HVT Stage 2 collaborative annexes, to project manage and deliver an assessment of the hydrogen appliance supply chain ahead of the 2025 start date. Arup undertook a comprehensive evaluation of the market delivering three reports across an eight-month period from July 2022-March 2023. These reports have expanded upon existing relationships with appliance OEMs to articulate current product development programmes and highlight the current development areas across the entire supply chain.

Arup were again re-contracted with Cadent (as newly appointed leads of the collaborative Appliance Working Group) in April 2023, to deliver the 'Business Case' to DESNZ on behalf of the GDNOs, detailing the need for further support for hydrogen appliance development.

Arup can support this project as they have knowledge and understanding of:

• Appliances, meters, and ancillary components through work on procurement and development on the HVT Appliance Supply Chain Assessment project and the Hy4Heat programme.

• Key stakeholders: including DESNZ, GDNOs, appliance OEMs, trade bodies & technical consultants.

Scope

This activity/service is purely desk-based, with Arup completing ‘Phase 1’ over 3 months – this is the upfront work that can be carried out in readiness for the full appliance procurement and development programme (Phase 2).

Phase 1 is made up of:

• Phase 1a – ITT Development

• Phase 1b – PMO Design (running in parallel) to set up the management structure and processes for the eventual procurement and development programme.

Phase 1a – ITT Development

The development of ITTs is a significant step in progressing towards the proposed development programme, and Arup will be following a similar process that was successful during the delivery of Hy4Heat.

The first is to define the scope. This will be based on robust survey data from NGN, NGN's consumer proposition and checked against those appliances currently already under development from OEMs. Arup will be taking the data compiled by the AWG and using this to define the scope for the ITTs.

The second and most significant step is for the development and writing of the ITTs. Taking the feedback and learnings from Hy4Heat, this will include:

· A bespoke technical specification, providing the technical requirements for the Tenderer, including information regarding certification and testing. This work will be supported by Kiwa as the technical leads on this project.

· A scoring system from which the Tender response will be scored against.

· Confirmed T&Cs for procurement. This will be dependent on the contracting entity confirmed for Phase 2 of the programme.

Arup believe that with the appliances confirmed for development, that four or five different procurement events would be necessary.

Phase 1b – PMO Design

Arup’s approach to design and mobilise the PMO is based on industry best practice and standards (P3O®, MSP®) and Arup’s experience in designing, establishing, and managing the PMO for the Hy4Heat Programme. Arup propose a four stages methodology.

This will be a natural continuation of the work that Arup has conducted on behalf of the AWG, which has seen delivery of timely, high-quality deliverables for the GDNO’s stage 2 HVT submissions, and ongoing collaboration across AWG and wider industry stakeholders.

Arup will follow an iterative process to design a PMO fit for purpose in each of the project stages, and able to immediately support the HVT project teams. Arup envisage a number of key PMO activities spanning across Phase 1 and 2.

Objective(s)

In addition – a robust plan & delivery structure for the subsequent, larger ‘Phase 2’ programme must be established.

These activities will involve:

· Arup will collate & interpret the appliance survey data from all I&C (Industrial & Commercial) properties in the Redcar area, in addition to a significant sample of the survey data from domestic properties.

· Arup will, in parallel, draft the various ITTs & technical specs for all categories of hydrogen appliances required (determined by the

survey data)

· Arup will propose a PMO design for the subsequent Phase 2 programme.

· General engagement with the relevant stakeholders (GDNOs, DESNZ, and British Gas) via meetings throughout the duration of the contract.

General engagement with OEMs to maintain insight into the readiness & of potential of various appliance types.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

N/A

Success Criteria

Success would be having a set of ITTs produced (covering all hydrogen appliances required for successful delivery of the Redcar village trial) in addition to a robust plan & delivery structure for the subsequent, larger 'Phase 2' programme.

The standard of these deliverables must be accepted by both Cadent (as appliance working group leads) & NGN (as Redcar trial leads) and be complete before the end of December 2023

Project Partners and External Funding

Arup (as an external supplier) will be managed by and contracted jointly to Cadent (as appointed leads of the wider Appliance Working Group – which includes WWU & SGN) and NGN (as Redcar trial leads).

Arup also propose to sub-contract with Kiwa Energy for specialised technical support.

The value of the external contract to Arup should be ~£162k, covered 50/50 by Cadent & NGN (£81k each).

However, Cadent will also provide internal 'contributions in kind' via 20-30 days of labour time (for circa ~£20k equivalent value, 25% of total Cadent budget).

Potential for New Learning

The new learning of this activity will be limited to the additional I&C survey information from Redcar, detailing the specific appliance conversion requirements of commercial businesses within the trial area.

The readiness/availability of hydrogen equivalents will be determined with reference to the previous 'Development' & 'Procurement Strategies' from Stage 2 of the HVT programme, before technical specifications of the necessary appliance development will be fed into the ITTs.

The total costs of developing the full suite of hydrogen appliances will also be estimated and shared with key stakeholders (DESNZ & the GDNOs).

Scale of Project

The project is a relatively short sprint to cover ~12 weeks of work across October-December, with a moderate external budget of £162k.

This is to enable the completion of Phase 1 prior to the HVT Stage 3 GFA, anticipated in Q1 2024.

Arup will continue to coordinate engagement with appliance OEMs, and work with Cadent (as Appliance Working Group leads) and NGN (as Redcar trial leads) to help to develop the ITTs & the Phase 2 plan.

SGN & WWU are regularly engaged via the collaborative appliance working group, and would also benefit indirectly from the successful delivery of the HVT trial in Redcar.

Technology Readiness at Start

Technology Readiness at End

TRL2 Invention and Research	TRL2 Invention and Research

Geographical Area

The bulk of the work will be completed by Arup as external suppliers, and desk-based. The relevant team at Arup are based in London.

However, NGN will be completing further surveys of I&C properties in the Redcar trial area, in the North East of England.

Cadent & NGN will manage the contract and coordinate the completion of the deliverable. Cadent HQ is in Ansty, Coventry. NGN HQ is in Thorpe Park, Leeds.

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

An indication of the Total NIA Expenditure that the Funding Licensee expects to reclaim for the whole of the Project (RIIO2).

· External Costs: £162k (Arup) – split 50/50 between Cadent & NGN (£81k each)

Internal Costs: ~£20k for Cadent (25% of external contribution, representing the labour time for an Innovation Programme Manager, Project Engineer and PMO in support of the project).

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:

This project is a critical enabler to the Hydrogen Village Trial (HVT) programme – which is ultimately environmentally focussed with the long-term aim of demonstrating that the existing natural gas network can be transitioned to facilitate hydrogen in the future.

This workstream is specific to the development of hydrogen appliances (mainly for use in heating and cooking) in domestic and commercial properties.

Benefits include:

From a technical perspective - hydrogen appliances are made available in time for trial deployment and can be offered as suitable alternatives to current natural gas appliances in Redcar.

· From a consumer perspective – an adequate level of choice is offered to further encourage participation.

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)

N/A – refer to savings of the wider Redcar HVT programme.

Please provide a calculation of the expected benefits the Solution

This is for Development or Demonstration Projects, not required for Research Projects. It should be (Base Cost – Method Cost, Against Agreed Baseline) and include a description of the recipients of the benefits.

N/A – refer to benefits of the wider Redcar HVT programme.

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

The Redcar trial requires various hydrogen appliances and hence benefits from this activity.

All GDNs indirectly benefit from a successful HVT in Redcar - and hence maximising hydrogen appliance development and consumer choice is of mutual interest.

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

N/A – refer to costs of the wider HVT programmes

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

N/A

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.

All GDNs are aware of this activity and aligned with the new proposal – ensured by continual engagement through the collaborative Appliance Working Group (AWG).

Cadent (as leads of the Collaborative Appliance Working Group) & NGN (as leads of the Redcar village trial) will jointly manage and coordinate the delivery of this project and provide regular updates to the wider group via bi-weekly monitoring calls.

The proposed HVT Appliance Development Programme (most relevant for NGN), should also be closely aligned with any development activities conducted by the SGN team for H100 – as there may be some opportunities for collaboration/crossover. Cadent & NGN will maintain frequent communication with SGN to ensure that these opportunities are identified and hence any duplication is avoided.

(This could apply to domestic cookers and fires in particular – however a greater range of choice is required for consumers in the HVT).

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

RIIO-1 projects must include description of why they have not been tried before.

The HVT is a first-of-a-kind programme (repurposing existing natural gas infrastructure for use with hydrogen), hence is highly innovative.

Various hydrogen appliances have been somewhat 'developed' in other previous (or upcoming) programmes; however, the needs of each project are distinct.

Generally, the sequencing with regards to appliances across the relevant programmes could be summarised as:

1. Hy4Heat (concept domestic & commercial appliances were developed – not products)

2. H100 (requires domestic products with minimal choice)

3. HVT (requires domestic products with greater choice & commercial products with limited choice)

4. Hydrogen Towns (will require domestic & commercial products with greater choice in addition to larger, bespoke/tailored industrial & process appliances)

Therefore, the appliance development programme in question is focussing on enabling a greater choice of fully certified & marketable products. This has not been done before, because it has not been required prior to the HVT.

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

External Costs: £162k (Arup) – split 50/50 between Cadent & NGN (£81k each)

Internal Costs: ~£20k for Cadent (25% of external contribution, representing the labour time for an Innovation Programme Manager, Project Engineer and PMO in support of the project).

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 would be a natural evolution of NIA_CAD0090 – a previous NIA contract (led by Cadent, on behalf of the wider Appliance Working Group) with Arup (value circa £54k) for delivery the of Hydrogen Appliance Development 'Business Case' to DESNZ.

Therefore, it is appropriate for the continuation of this NIA activity to be housed within the same framework. This activity is time-critical for the HVT programme and therefore the quickest and simplest route forward should be taken.

This project has been approved by a senior member of staff

☑ Yes