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 2023

Project Reference Number

NIA_CAD0090

Project Registration

Project Title

HVT Appliance Development Business Case

Project Reference Number

NIA_CAD0090

Project Licensee(s)

Cadent

Project Start

April 2023

Project Duration

0 years and 6 months

Nominated Project Contact(s)

Michael Sinclair – Project Engineer; David Jones – Innovation Programme Manager

Project Budget

£72,530.00

Summary

Short 'sprint' to cover 6-8 weeks continuation on the Appliance Supply Chain workstream across April & May 2023, following the closure of HVT Stage 2. This is an extension of Arup's role from Stage 2 (following completion of the collaborative Procurement Strategy). Arup will continue to coordinate engagement with appliance OEMs, and work with Cadent (as Appliance Working Group leads) and DESNZ representatives, to help to develop the 'Business Case' to unlock the additional funding required to stimulate the appliance development necessary for the HVTs (in either Whitby or Redcar).
The project is in collaboration with the other gas networks, however Cadent would lead and fund this project on their behalf (similar to more recent hydrogen village collaboration projects undertaken over 2022/23 and into 2023/24).

Preceding Projects

NIA2_SGN0026 - Hydrogen Village Trial Hydrogen Appliance Supply Chain

Third Party Collaborators

Ove Arup & Partners Ltd

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. Following an assessment period in Spring 2022, Ofgem published on 6 May a decision document announcing that the proposals from Cadent (Whitby) and NGN (Redcar) had been selected to proceed to the next stage of the project.
The village trial will convert a large village of around 1,000-2,000 properties to hydrogen for heating instead of natural gas. Led by the gas networks, 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 has 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), and more work is needed to aid the government in exploring the needs-case to unlock the funding necessary to stimulate this development. This applies particularly to domestic cookers and fires, in addition to commercial catering appliances.

Method(s)

This activity/service is purely desk-based, with work including coordination of meetings, management of stakeholders, and writing final recommendation reports.
Arup was 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 have undertaken 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.
Cadent, as new leads of the AWG (hence on behalf of the GDNs), will contract with Arup for this short-term service. 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, Ofgem, other GDNOs, appliance OEMs, trade bodies and technical consultants,
• The wider hydrogen economy landscape through work as DESNZ's Hydrogen Technical Advisor, and on BEIS' Hydrogen Advisory Council and Working Groups

Scope

This activity/service is purely desk-based, with work including coordination of meetings, management of stakeholders, and writing final recommendation reports.
The scope is fully aligned within 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.
Hence the benefits are ensuring that:
• From a technical perspective - hydrogen appliances are available in time for trial deployment, and can be offered as suitable (safe and functional) alternatives to all current natural gas appliances in both trial areas
• From a consumer perspective – an adequate level of choice is offered (i.e., an appropriate variation of appliance sizes, models, colours, and brands etc.) to further encourage participation.

Objective(s)

Arup will develop an appliance development business case report. This will be based on previous project engagement with GDNOs, government and OEMs. The key themes of the business case report will be:
• To fully explain the current shortcomings of hydrogen appliance development
• To detail and articulate existing relationships with appliance OEMs and their desire to further develop hydrogen appliances in the UK

• To provide cost analysis as to level of funding required to meet demand of the HVT
• To highlight the time-critical nature of this work with a concise timeline for future OEM development
• To suggest the framework for which this work can be delivered, with government, GDNOs and OEMs working together
• To outline a method and means for which any future procurement exercise will take place, defining any future funding methods, stating milestones, whilst considering lessons learnt from previous projects
• To define a future working structure, combining expertise from government, regulatory bodies, GDNOs and technical advisor

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

N/A

Success Criteria

Success would be the delivery of a proposed 'Business Case' report (as per Section 2.4) to evidence & justify the additional government funding required to facilitate the necessary appliance development between now (Stage 2) and Stage 4 (deployment) of the HVT.
The standard of this deliverable must be accepted by the wider Appliance Working Group (led by Cadent - supported by NGN, SGN and WWU) and be complete before the end of May 2023.

Project Partners and External Funding

Arup (as an external supplier) will be managed by and contracted to Cadent (as appointed leads of the wider Appliance Working Group – which includes NGN, WWU and SGN).
The value of the external contract to Arup should be ~£32k.
However, Cadent will also provide internal 'contributions in kind' via 10-15 days of labour time (for circa ~£11k equivalent value, 25% of total budget).

Potential for New Learning

There will be minimal 'new learning' as such from this activity – as the learning was all gained via the delivery of both the 'Development Strategy' and 'Procurement Strategy' by the Appliance Working Group during Stage 2 of the HVT.
These reports have evidenced the likely time & costs required to develop the desired suite of hydrogen appliances (mainly domestic cookers and fires, in addition to commercial catering equipment) for the HVT. Therefore, the learning from these reports will enable the formal 'Business Case' in question – which is a more communicative piece to Government to demonstrate the needs-case for additional funding.
The Development & Procurement Strategies were shared with the full Appliance Working Group (all 4 GDNs and the ENA), and the Business Case will be shared with the group (when drafts are available for review) in a similar vein. The final and ultimate recipient of the report will be DESNZ.

Scale of Project

The project is a short 'sprint' to cover 6-8 weeks of work across April & May, following closure of HVT Stage 2. Arup will continue to coordinate engagement with appliance OEMs, and work with Cadent (as Appliance Working Group leads) and DESNZ representatives, to help to develop the 'Business Case' for circa ~£12m of funding to stimulate the appliance development necessary for the HVTs (in either Whitby or Redcar).
The project is in collaboration with the other gas networks, however Cadent would lead and fund this project on their behalf (similar to more recent hydrogen village collaboration projects undertaken over 2022/23 and into 2023/24).

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL2 Invention and Research

Geographical Area

The project is purely desk-based, with the bulk of the work being completed by Arup as external suppliers. The relevant team at Arup are based in London.
Cadent will manage the contract and coordinate the completion of the deliverable. Cadent HQ is in Ansty, Coventry.

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: £32k (Arup: £30k fixed cost + up to £2k expenses)
- Internal Costs: 25%, £11k (Cadent: labour time for Innovation Programme Manager, Project Engineer and PMO)

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.
Hence the benefits are ensuring that:
• From a technical perspective - hydrogen appliances are available in time for trial deployment, and can be offered as suitable (safe and functional) alternatives to all current natural gas appliances in both trial areas
• From a consumer perspective – an adequate level of choice is offered (i.e., an appropriate variation of appliance sizes, models, colours, and brands etc.) to further encourage participation.
A successful hydrogen village trial would provide key evidence to UK Government that hydrogen is a viable alternative to natural gas for heating and could therefore help facilitate the energy system transition.

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 HVT programmes.
If the problem is not solved – suitable hydrogen cookers, fires and catering equipment (tested and certified) will almost certainly not be ready and available for use in the HVT.

Please provide a calculation of the expected benefits the Solution

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

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

Both proposed trials (Redcar & Whitby) require hydrogen appliances and hence benefit from this activity.
All GDNs benefit from a successful HVT – whichever is selected for Stage 3 – 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.
Total required budget (communicated in 'Business Case') for necessary development work is expected to be around £12m.

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 – as it is a continuation of the original NIA activity led by SGN. Cadent (as newly appointed leads of the Collaborative Appliance Working Group) will manage and coordinate the delivery of this project on behalf of all GDNs and provide regular updates to the wider group via weekly monitoring calls.
The proposed HVT Appliance Development Programme (most relevant for Cadent and 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 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

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 (mostly domestic cookers & fires, in addition to commercial catering equipment). 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

This project is not BAU - as GDNs would not typically be involved in appliance development (as this is downstream of the 'network' or ECV, with appliances essentially being 'end-users' inside properties).
Therefore, the programme is being coordinated by the GDNs given the ultimate need for hydrogen appliances for the HVT – however external support and funding is both required and appropriate.

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 continuation of NIA2_SGN0026 - the original NIA contract (led by SGN, on behalf of the wider Appliance Working Group) with Arup (value circa £200k) for delivery the of Appliance Procurement Strategy across Stage 2 of the HVT, within the Collaborative Annex.
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