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

Mar 2024

Project Reference Number

NIA_CAD0101

Project Registration

Project Title

IGEM Downstream Hydrogen Standards Development

Project Reference Number

NIA_CAD0101

Project Licensee(s)

Cadent

Project Start

March 2024

Project Duration

0 years and 7 months

Nominated Project Contact(s)

Brad Bannerman

Project Budget

£533,334.00

Summary

Hydrogen remains a viable option in the decarbonisation of homes and businesses in the UK. To support the safe end use of hydrogen in domestic and non-domestic properties, technical standards are being developed to enable the training of downstream engineers to convert, and then operate, existing gas installations under hydrogen service. The Gas Distribution Network Operators (GDNOs), and the Department for Energy Security and Net Zero (DESNZ), have delivered a vast amount of end user hydrogen safety research over the past two years which must be reflected in any hydrogen-enabling downstream standards. This project is therefore designed to assist the Institute of Gas Engineers and Managers (IGEM) in amending their downstream hydrogen standards to reflect the latest understanding of the research ahead of publication.

Preceding Projects

NIA_CAD0097 - Dispersion of Helium Releases in Domestic Properties

NIA_NGN_292 - H2GO - Domestic Hydrogen Detector

NIA_WWU_2_12 - EUSE - Ventilation Within Buildings

Third Party Collaborators

Kiwa

DNV

Enertek International Ltd

Nominated Contact Email Address(es)

Innovation@cadentgas.com

Problem Being Solved

The UK Government's Ten Point Plan for a Green Industrial Revolution set out the government's intent to explore the option of hydrogen to be used within the current gas network infrastructure. In December 2023, DESNZ published the "Hydrogen Strategy Delivery Update" which, despite ruling out the progression of a Hydrogen Village Trial, left hydrogen on the table as a potential replacement heating fuel for buildings currently heated by natural gas, transported through the existing gas grid. Government has committed to making strategic decisions on the role of hydrogen in heating in 2026 and in the meantime, industry must demonstrate to policymakers that the available evidence base on the use of hydrogen in domestic and non-domestic buildings has been properly interpreted into a set of approved technical standards to support future conversion.

The problem of interpretation of existing evidence into technical standards is what this project is being set up to address. Building on the findings of Hy4Heat, the GDNOs and DESNZ have led parallel research programmes, End User Safety Evidence and Hydrogen Skills and Standards for Heat respectively, designed to address evidence gaps identified by the HSE. These programmes have focused on gathering safety evidence downstream of the emergency control valve (ECV) to support delivery of any early hydrogen trials and potential wider rollout across the UK. In parallel, IGEM have been commissioned to develop the downstream hydrogen enabling standards for domestic (IGEM/H/2) and non-domestic (IGEM/H/3) properties. Unfortunately, the timelines of the research and the standards development were not completely aligned, which has resulted in the latest versions of the IGEM Standards not reflecting the latest understanding of the research.

The problem to be addressed by the project is therefore simply to ensure the 2024 amendments to the IGEM/H/2 and IGEM/H/3 standards reflect the latest understanding of the research, enabling practical working procedures to be developed for engineers to follow.

This project is one of the GDNOs collaborative projects, led by Cadent, and will be undertaken as part of the End User Safety Evidence working group.

Method(s)

This project is predominantly a technical demonstration project designed to assist IGEM in translating the available body of research into industry approved downstream hydrogen standards.

The methods that will be used to provide a solution to the problem outlined above can be grouped into 3 key areas:

i) Review of latest versions of the standards: This will involve a 'gap analysis' type exercise to identify which aspects of the latest versions of the standards do not align with the latest understanding from the research. Part of this exercise will also be to identify the specific research projects/reports which contain the information required to enable the standard to be amended.

ii) Delivery of Technical Workshops: One of the key barriers to proper translation of the research has been the lack of practical demonstration for stakeholders, like the IGEM Working Group, who have not been close to the individual research projects developing the latest evidence base. A critical part of the solution here will be demonstration of all relevant work processes/recommendations from the research and subsequent discussion to support agreement being reached between all stakeholders on the identified 'gaps' via the delivery of a series of technical workshops.

iii) Delivery of Conversion Work Processes: The ultimate deliverable of this work is the amended IGEM standards which is a responsibility of IGEM and not this project. To facilitate this however, the project will be responsible for delivery of accepted conversion processes, based on the practical demonstration and discussions at the workshops, to feed into the amended standards and influence the specific clauses identified in the 'gap analysis' exercise that require amending ahead of publication.

Project delivery will be supported by hiring professional organisations to support Cadent and the other GDNOs with evidence translation and demonstration as part of the project. British Gas will also provide a supporting role to the project team as downstream gas installation experts.

Measurement Quality Statement

The project is not set up to measure specific data, rather to demonstrate conversion processes informed by data measured in previous research projects from the EUSE (funded by NIA) and HSS4H programmes. Naturally, there will be measurement equipment associated with the demonstration of typical downstream gas processes (pressure testing, purging etc.) and this will all be certified

equipment, calibrated where necessary in line with any manufacturer's instructions.

Data Quality Statement

As per the measurement quality statement, the project is not set up to collect data, rather to demonstrate technical engineering practices informed by data collected in previous research projects.

Risk Assessment Scoring

The project does not involve the development of a specific product and so there is no TRL change associated. The external project cost is <£500k, however, although the responsibility for delivery lies with a single supplier, successful delivery will require the support of multiple suppliers and cross-industry collaboration. In terms of the data, assumptions and principles are well defined by previous work – this project will support justification as to why certain assumptions/principles can be adopted.

The assessed risk score is 5 (Low) which allows the project to be governed by an internal assurance approach as set out in NIA Governance and ENIP.

Scope

To deliver and interpret the information required to enable IGEM to make the necessary amendments to their downstream hydrogen standards, the project will consist of three work packages. The scope of this project is purely to demonstrate hydrogen conversion work processes recommended by previous research, providing IGEM with the information they need to amend the standards to a point of industry consensus. Formal amendment of the standards themselves is out of scope of this project, however, this project is a critical enabler for IGEM to carry out the necessary amendments.

WP1 – Agreement of Scope and User Requirements

The project will start by reviewing the current scope of H/2 and H/3 and identifying specific sections/clauses with technical divergence from the current research. A review of relevant literature will be undertaken in parallel to ensure that appropriate references are identified to address recognised issues. Also included in this work package will be preparations for WP2 via the design and build of demonstration rig(s) to support the technical demonstration and discussion as part of the workshops. These activities will all take place simultaneously as part of the WP1 effort, which will culminate in the delivery of draft end-to-end conversion work processes, informed by the evidence, detailing the process from the first visit to 'any property' to leaving 'any property', with the property safely converted hydrogen. These draft conversion processes will be used to direct the workshops in WP2.

WP2 – Dissemination of Knowledge

WP2 will focus on engaging key stakeholders in a series of workshops where the draft conversion processes, the deliverable of WP1, will be presented. Each workshop will present different topics associated with the conversion of a downstream gas installation/property from natural gas to hydrogen operation. The different topics will be discussed, demonstrated where appropriate on the demonstration rig(s) built in WP1, and a recommended approach agreed.

Minutes and a series of short reports capturing the discussion/agreements at the workshops will be produced throughout WP2 to support the final deliverables of the project to be delivered on completion of WP3.

WP3 – Revision and Agreement of Conversion Processes

On completion of the workshops in WP2, the focus of WP3 will be on incorporating the feedback from the workshops and finalising the conversion work processes originally drafted in WP1. This represents the final deliverable(s) for the project and will be delivered to IGEM who will look to incorporate the work processes, and any other agreed amendments to the standards from the workshops into two amended standards for submission to the various IGEM Technical Committees for approval.

Objective(s)

The objective of this work is simply to assist IGEM in creating amendments to their downstream hydrogen standards (H/2 and H/3) that can be approved for publication for wider industry, by including more of the research evidence produced to date.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

An assessment of distributional impacts (technical, financial and wellbeing related) for this project has been carried out using a bespoke assessment tool, which assesses the project as having a positive, negative, or neutral effect on consumers in vulnerable situations. To help inform the assessment, this tool considers the categories of consumers identified in the Priority Services Register.

This project has been assessed as having a positive impact on customers in vulnerable situations. The assessment has identified that this project will look to improve the exchange of information between networks and customers while reducing the amount of disruptions to them in the home as part of any future hydrogen conversion. The project will enable the publication of downstream hydrogen enabling standards which will facilitate information exchange on what hydrogen conversion will look like for customers – at the forefront of this conversion will be ensuring the health and safety of customers in the home whilst bringing about minimal disruption to the customer and their property during the conversion process.

Success Criteria

The success criteria for the project are the delivery of the following:

- Draft conversion processes, supported by previous research.

- A series of technical workshops attended by key stakeholders from the gas industry and UK government.

- Final conversion processes, reflecting discussions held in the workshops, to be incorporated into industry approved IGEM downstream hydrogen standards.

Project Partners and External Funding

The project partners are:

Cadent Gas Ltd

SGN

Northern Gas Networks

Wales & West Utilities

The project will be wholly funded via NIA.

Potential for New Learning

The conversion of domestic and non-domestic properties in the UK to hydrogen for heating and cooking will require clear guidance to be in place for engineers to be trained on, and follow, as part of any conversion exercise. The parties involved in this project have been responsible for a vast amount of end user hydrogen research and so the project is not so much about new learning from a technical perspective, but from the perspective of how that new learning can be incorporated into technical engineering standards that engineers will have to follow in the real world. This learning will be useful for supporting future research in making its findings more easily translated into industry standards.

Project outputs will be disseminated to GDNs, HSE and key stakeholders through the draft conversion processes in WP1, a series of short reports/minutes as part of the workshop process, culminating in the delivery of final, agreed conversion processes for inclusion in the amended IGEM standards which are dependent on the outputs of this work

Scale of Project

A clear understanding of the conversion process to be followed in ‘any property’ is critical to demonstrating that existing natural gas installations can be converted to hydrogen as part of the UK’s wider decarbonisation targets. The scale of investment is justified by the criticality of being able to demonstrate to the HSE and UK Government ahead of the planned 2026 policy decision that the gas industry can translate the existing hydrogen research base into engineering standards which are both technically sound and practical to apply.

As such, the work done in this project will play a pivotal part in determining the future role of hydrogen in the UK for heating and cooking.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

The project will take place online and in-person at various locations across the UK, with the workshops themselves due to take place in Cheltenham. The outputs will benefit all GDNs across GB.

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

The project is broken down into an agreed fixed external cost. The agreed fixed external cost for the project is £400,000.

This gives a Total NIA Expenditure to reclaim of £500,000 broken down into external and internal costs for each funding licensee as follows:

External Cost:

Total cost
£ 400,000.00 (=£360,000 (split) + £40,000 (Cadent only))% Split Cadent
£ 220,000.00 50.0% NGN
£ 45,000.00 12.5%WWU
£45,000.00 12.5% SGN

£90,000.00 25.0%

Internal Cost:

Cadent – £73,333.33

NGN – £15,000.00

WWU – £15,000.00

SGN – £30,000.00

This gives a total NIA Project Expenditure (including external and internal costs) of £533,333.33.

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 vital enabler of any future hydrogen conversion of domestic and non-domestic properties in the UK and as such, will play an important role in facilitating 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

Please provide a calculation of the expected benefits the Solution

Not applicable (this is a research translation project).

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

The intention is for this project to relevant to 'any property', domestic and non-domestic, to be converted to hydrogen in the future and so has the potential to be rolled out across 100% of the existing Network Licensees' systems.

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

N/A

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

☐ 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 learning can be used by any network that intends to convert its end user connections to run on hydrogen.

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.

Hydrogen standards for domestic and non-domestic users do not currently exist in the UK, or anywhere in the world, and this project is a critical enabler for IGEM to publish these first-of-a-kind standard. There is therefore no risk of duplication.

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

There are no projects similar to this. This project seeks to translate a range of novel, end user hydrogen research findings into practical working processes that can be incorporated into industry approved standards.

Additional Governance And Document Upload

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

This project is a critical enabler to the publication of the first downstream hydrogen standards in the UK. Standards of this kind have not been published anywhere else in the world to date. The publication of industry-approved standards in this space is a vital piece of evidence to support the HSE’s Comprehensive Formal Assessment of end user hydrogen applications to inform UK government heat policy decision in 2026.

Relevant Foreground IPR

The Foreground IPR of the project will come in the form of conversion work process documents for use by IGEM in the 2024 amendment of their downstream hydrogen standards. The IGEM standards themselves are not the Foreground IPR of this project, rather, this project’s outputs will enable the amendment and publication of the standards.

Data Access Details

All data used in this project will be sourced from published documentation amongst the key project stakeholders as a minimum.

Data for this project and all other projects funded under the Network Innovation Allowance (NIA), Network Innovation Competition (NIC) or the new Strategic Innovation Fund (SIF) can be found or requested in a number of ways:

· A request for information via the Smarter Networks Portal at https://smarter.energynetworks.org, to contact select a project and click 'Contact Lead Network'. Cadent already publishes much of the data arising from our innovation projects here so you may wish to check this website before making an application.

· Via our Innovation website at https://cadentgas.com/future-of-gas

· Via our managed mailbox futureofgas@cadent.com

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

The distribution of hydrogen, and associated enabling projects, cannot be considered as BAU due to its first of a kind nature and risks which go beyond BAU.

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 has inherent risks due to its first of a kind nature so it is right that it should be supported using NIA funding.

This project looks to enable an industry standard position to be taken on technical, operational, and regulatory considerations when converting domestic and non-domestic premises across the UK to be repurposed for hydrogen service.

This project has been approved by a senior member of staff

☑ Yes