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NIA Project Registration and PEA Document

Date of Submission

Oct 2024

Project Reference Number

NIA_CAD0102

Project Registration

Project Title

Hydrogen Blending Implementation Plan

Project Reference Number

NIA_CAD0102

Project Licensee(s)

Cadent

Project Start

October 2024

Project Duration

1 year and 1 month

Nominated Project Contact(s)

Damien Hawke

Project Budget

£1,155,000.00

Summary

Following the successful completion of Phase 1 in 2023, the gas networks have engaged with KPMG to design the market frameworks modifications necessary to facilitate hydrogen blending, and to develop a full operational implementation plan.

Running from mid-2024 for a period of twelve-months, the Phase 2A project will define how a 'hydrogen blend-ready' network will operate, and prepare a full set of detailed, implementation plans. Key decisions are required across the full range of market frameworks, as well as a clear view of the operational impacts from the ongoing safety assessment between HyDeploy and the HSE.

Mobilisation will begin in Summer 2024, whilst the main design stage will run for 8 months from September to April 2025, with project completion planned for June 2025.

Third Party Collaborators

KPMG

Xoserve

joint office of Gas Transporter

Nominated Contact Email Address(es)

Innovation@cadentgas.com

Problem Being Solved

1. Current regulations and network procedures do not support blending

The government have indicated support for use of the GB networks to transport hydrogen-blended gas – e.g. in the 2021 Hydrogen

Strategy and 2023 DESNEZ strategic policy decision to permit LDZ-level (subject to safety evidence review). However, industry will not be able to implement the government's intent without significant changes to regulations and operational practices.

The market frameworks that govern the rights and obligations of parties' using the GB gas networks currently pose a number of barriers to hydrogen blending. For example, the Gas Safety Management Regulations (GSMR) only permit 0.1%Vol hydrogen in the existing gas distribution networks. Additionally, a new market frameworks concept that governs parties entry capacity rights in a manner that protects the integrity of the hydrogen blend percentage cap (e.g. 20%) will need to be introduced.

With regards to operational readiness, the network companies' policies, equipment, assets, skills, and competencies are likely to require changes in order to safely transport hydrogen-blended gas, and evidence compliance with their amended Safety Cases.

The Phase 2A KPMG project will utilise NIA funding to collaboratively design the suite of market framework modifications necessary in order to facilitate hydrogen blending. The project will also develop a detailed operational implementation plan, that will help the networks to consistently design changes to their internal policies and procedures in order to be 'blend-ready'.

2. Hydrogen producers' risk of curtailment

Although industrial users' demand for hydrogen currently outweighs supply, future producers may be wary of the risks of curtailment in the event that connected consumers reduce their usage, or there is faster growth in production than demand. DESNEZ's 2023 strategic policy decision supported the use of hydrogen blending as an 'offtaker of last resort', allowing any surplus hydrogen to be utilised in gas network blending will mitigate the risk of curtailment and provide certainty of investment to producers.

3. Inconsistent rules and polices would create challenges for customers

Although subject to important differences, the gas networks are able to take key learnings from the design and development of biomethane as a means of decarbonisation. There are examples where distribution networks have adopted different positions and processes when developing their biomethane entry customer journeys. Many biomethane producers have activity across multiple network company footprints and can potentially face confusing and unequal interactions with the networks that they are attempting to connect to. By utilising NIA funding to collaborate in the design of a common set of market framework and operational changes, the gas networks are more likely to derive a hydrogen blending customer journey that is consistent and simpler for parties to interact with.

Method(s)

The networks have selected KPMG to deliver a 12-month programme focusing on the development of the final market frameworks blending delivery model and a full operational implementation plan. As the supplier, KPMG will bring a wealth of experience from other hydrogen-focussed decarbonisation work including HyDeploy and East Coast Hydrogen. KPMG will assist with the design of the project's market framework and operational readiness changes by evidence gathering, optioneering, analysing options, and making recommendations to the networks' project steering group for final decisions and sign-off.

KPMG will also lead on industry and stakeholder engagement activities, in order to ensure that the views of parties such as producers, shippers, Ofgem, and DESNEZ are considered. This engagement will be crucial in ensuring that the policy intent of government is reflected, and that any new market framework and operational procedures provide a solution for industry that is investible and deliverable.

The KPMG Phase 2A project will be structured into the following stages:

Stage 1: Mobilisation

Forecasted to run for a period of two-months, the Mobilisation stage aims to achieve the following objectives:

- All working group members will be onboarded, with the programme structure, roles and responsibilities, and governance clearly defined;
- A clear hierarchy of delivery principles will be created, that will in turn inform the development of a process used by the project to evaluate options and make decisions on market framework and operational changes;

The following activities will be completed in order to ensure that the Mobilisation stage objectives are achieved:

- Terms of Reference and the overall project governance structure will be confirmed, ensuring that roles and responsibilities and the accountability for making decisions is clearly understood by all parties;
- The gas networks and KPMG will agree the mechanism for engaging external stakeholders and the process for considering their views in overall decision making;
- Establish the membership, frequency, and documentation that will support the project's various working groups;
- Work with external stakeholders to co-create high-level design principles and priorities, and seek endorsement from DESNEZ and Ofgem;

Stage 2: Shortlisting

Forecasted to run for a period of four-months, the Shortlisting stage aims to achieve the following objectives:

- To identify consolidated shortlists of viable options for modifications across all market framework and operational readiness workstreams, and develop an understanding of how the options interact with one another when formed as an overall strategy;

The following activities will be completed in order to ensure that the Shortlisting stage objectives are achieved:

- To list all identified options across each of the decision areas (e.g. capacity, connections, nominations etc.) and note inter-dependencies and interactions between them;
- Conduct high-level assessments of operational feasibility and resource requirements for each option;
- Assess longlist of options against the process that was devised in the Mobilisation stage, and identify shortlisted options to progress into the next stages of the project;

Stage 3: Finalisation

Forecasted to run for a period of four-months, the Finalisation stage aims to achieve the following objectives:

- To determine minded-to-positions on the suite of market framework and operational readiness changes that comprise the holistic final blending delivery model;
- Produce detailed assessment papers that provide evidence in support of the minded-to-positions;

The following activities will be completed in order to ensure that the Finalisation stage objectives are achieved:

- Complete detailed options cross-compatibility assessments and an interactions map to demonstrate that the minded-to-position selections do not preclude other viable options from being considered;
- To determine the scoring and weighting criteria for the final assessment and to develop an optimum sequencing of decision-making between the different workstreams;
- Score and assess the shortlisted options to create final minded-to blending delivery model;

Stage 4: Delivery Preparations

Forecasted to run for a period of two-months, the Delivery Preparations stage aims to achieve the following objectives:

- To finalise the delivery model, through engaging key industry stakeholders and incorporating their feedback where appropriate;
- To prepare the operational readiness delivery plan;

The following activities will be completed in order to ensure that the Delivery Preparations stage objectives are achieved:

Conduct effective engagement with industry stakeholders to ensure that holistic views are considered and that the finalised delivery model provides solutions that are investible and deliverable;

Delivery Workstreams

Each of the above project stages' objectives and activities will be split across distinct workstreams. Each workstream will be

comprised of subject matter experts from the gas network funders and KPMG. The workstreams will be responsible for refining the identified design options into shortlists and making recommendations to the steering group.

Adopting the same approach as the Phase 1 project, the 2A workstreams will be split into:

- Market Frameworks
- Operational Readiness
- Project Pipeline

Market Frameworks workstream

This workstream will develop and define the market framework changes necessary to permit hydrogen blending within the GB gas networks. It will create a change-management programme for coordinating the design of modifications to key gas network frameworks such as: the Uniform Network Code, the Xoserve Data Services Contract, ancillary agreements such as Network Entry Agreements, and network charging statements.

KPMG and the gas networks have [1] identified the below areas (with associated actions) as key considerations under the Market Frameworks workstream:

- Connections Capacity, Charging, Trading and Balancing
 - Develop the market-based processes for hydrogen producers/entry points to connect to the network, book capacity, and nominate/trade hydrogen volumes into the network (both for primary offtaker and offtake of last resort arrangements)
 - Review the changes required to network codes and licenses (incl. definitions, duties, and emergency provisions to facilitate these changes)

1] Non-exhaustive list – the gas networks and KPMG will build on Phase 1 to map a full list of market framework considerations

- Gas Quality and System Operation
 - Determine the specifications, controls, and associated system monitoring processes for hydrogen volumes entering the network (differentiated by 5% and 20%)
 - Review the amendments required to network codes and licenses, and operational requirements to facilitate these changes
 - Review any non-core impacts and controls required (e.g. interconnector trading, potential EU 2% blend cap, de-blending)
- Communication and Co-ordination
 - Determine any additional or bespoke communications and coordination required between networks to manage blended hydrogen flows

Operational Readiness

This workstream will be responsible for considering how the potential market framework modifications and emerging health and safety evidence may shape changes to gas networks' operational processes and procedures.

KPMG and the gas networks have identified the below areas (with associated actions) as key considerations under the Operational Readiness workstream:

- Prepare a detailed operational implementation plan following outcomes from the safety evidence review and Market Frameworks workstream, that is able to be implemented as part of the Project's subsequent Delivery phase
- Identify any no / low regret actions that can commence prior to the end of Phase 2A, to ensure the overall programme remains deliverable on time

Project Pipeline

This workstream will be responsible for managing the relationship between the requirements, locations, and likelihood to blend of hydrogen production projects, with the design of the required market framework and operational readiness changes. This will be for

the purpose of ensuring that the final blending implementation plan is attractive for other stakeholders and provides investible and deliverable solutions to industry.

KPMG and the gas networks have identified the below areas (with associated actions) as key considerations under the Project Pipeline workstream:

- Identify a detailed pipeline of projects seeking to blend, and develop a 'free market' framework for the selection of projects and allocation of capacity
- Engage with projects on technical and commercial considerations, and feed the outputs into the Operational Readiness workstream plans

Additionally, KPMG and the gas networks have identified the following stakeholder groups that need to be engaged under the Project Pipeline workstream:

- Government and Ofgem:
 - o Supporting the development of the delivery principles and programme structure
 - o Provide further policy direction on outstanding issues that will design (e.g. passing down of Low Carbon Hydrogen Certificates)
 - o Give ongoing steer on the acceptability of emerging delivery model (especially at key decision points)
- Gas Market Participants:
 - Provide evidence/expert insights on the viability of shortlisted options, and support with the identification of impacts on existing gas market users (e.g. commercial viability of shipping arrangements for blended gas)
 - Offer suggestions on the design improvements/features for any unconsidered impacts of the emerging Market Frameworks and Operational Readiness models
 - Act as critical friend to identify any early issues with the minded-to-positions, enabling the project to amend designs prior to the formal UNC modification process

Hydrogen Producers

- Provide insight on the attractiveness of the proposed delivery model design options, and the interaction with the LCHA / hydrogen market
- Engage with networks on potential blending projects, to support Project Pipeline development and inform targeting of operational readiness resources

Data Quality Statement

The project will utilise data from a range of sources to ensure that the market frameworks blending delivery model and the full operational implementation plan are well informed, robust, and attractive to a range of industry participants (e.g. any amendments to gas networks' charging methodology to account for the additional costs of blending/transport blended gas will be data driven).

- Data provided by both historic hydrogen projects and those being delivered in tandem – e.g. HyDeploy
- Data provided by the gas transporters participating in the project
- Data provided by KPMG from their relevant, recent experience in other decarbonisation programmes
- Data provided by industry third parties such as Xoserve and the Joint Office of Gas Transporters

The project will ensure that all data utilised as part of the project is robust, transparent, and auditable by creating a reference system.

Clear and consistent referencing will be used as part of any analysis that seeks to draw upon such data throughout the course of the project, ensuring full traceability to underpinning data sources.

All data sources shall be filed in an archiving system, with access made available to stakeholders (subject to any confidentiality restrictions).

Measurement Quality Statement

The gas networks and KPMG will ensure that the data obtained to aid delivery of the project will be appropriately measured and assured.

- Operational testing will be conducted in a rigorous and robust manner (e.g. cross referencing across networks to eliminate abnormalities and through consistent methodologies etc.)
- Minded-to-positions and decision-making processes will be based on a clear understanding of the qualitative and quantitative measurement of Market Framework and Operational Readiness options
- Measurement activities shall be conducted by appropriately skilled personnel from both the networks and KPMG, and recorded through robust project management controls

Scope

Scope and Objectives

National Gas Transmission and the four GB gas distribution networks have commissioned KPMG to assist their delivery of the next twelve-month phase of the collaborative Hydrogen Blending innovation project. Building upon the successfully delivered Planning phase in 2023, the 2A Design phase aims to collaboratively develop two key deliverables:

1. Market Frameworks Blending Delivery Model = a report containing the full suite of modifications (with supporting evidence, options analysis, and rationale) required to the range of documents/regulations across the GB gas networks market frameworks hierarchy.
2. Operational Readiness Implementation Plan = driven by the recommendations from the Market Frameworks Blending Delivery Model and safety evidence, a full project plan containing the sequenced activities that require completing by the gas networks in order to achieve 'blend ready' status.

This project sets out to develop the UK's final blending delivery model, and a full operational implementation plan, with 3 key, critical success factors:

1. To design an investible commercial structure for blending
2. To ensure the gas network is ready on time
3. To ensure the outcome is fair and efficient

Overall, the Design phase of the project should deliver a clear blueprint to the GB gas networks for the market framework modifications and operational readiness activities required to facilitate hydrogen blending. These modifications and activities can then be taken forward and implemented as part of the subsequent Delivery phase.

Net Benefits for Consumers

The UK Government announced its intention to support LDZ-level hydrogen blending in December 2023, giving the industry the clarity it required to continue the transformation of the GB gas networks to enable hydrogen injections.

DESNZ detailed the benefits of hydrogen blending in their consultation document “Hydrogen Blending into GB Gas Distribution Networks”. The document discusses the value of having hydrogen blending available to support the early development of the hydrogen economy, in particular, to manage the risks of hydrogen producers being unable to sell sufficient volumes of hydrogen, impacting their revenues, and hence access to finance.

Additionally, in the initial absence of large-scale hydrogen transportation and storage infrastructure, it recognises a strategic role for blending to enable electrolytic hydrogen producers to exploit renewable electricity that would otherwise have been curtailed.

Through its qualitative assessment of the benefits of hydrogen blending, DESNZ has assessed that utilising the GB gas networks to enable hydrogen blending has a number of clear benefits, including:

- Mitigating volume risk for producers, thus enabling them to access lower cost financing and reduce the cost impact on consumers
- Enabling plants to maintain their production profiles, potentially reducing their production costs per MWh, which in turn should translate into a lower cost to consumers
- Reducing the levelised cost of hydrogen by increasing production load factors

Additionally, a consumer research study conducted alongside the hydrogen blending trials at Keele University and Winlaton found that there was strong support for the use of blended hydrogen in the home, in response largely to the perceived environmental benefits. The study concluded that “experiencing hydrogen in the home through a 20% blend could help pave the way to greater acceptance of 100% hydrogen”.

Evidence from the HyDeploy project suggests that significant environmental benefits can be realised through blending low carbon hydrogen with methane. If applied at a national scale, it is estimated that hydrogen blending could generate the same carbon saving benefits as annually taking two million cars off the road, approximately 5.1 MtCO_{2e} in equivalent green house gas emissions savings. [AE1]

Financial benefits are challenging to quantify at this stage, given that blending is inherently an enabler for the wider energy system transition. A DESNEZ report calculated that blending had the potential to reduce enduring hydrogen production, transport, and storage costs between 2.4% – 2.9%, creating a financial benefit that could offset the initial investment required to ensure gas network infrastructure is blend-ready.

[AE1] calculated this by researching the number of licenced UK vehicles (excluding zero emission vehicles) = 38,168,000 (2020 statistic).

I then researched the amount of mega tonnes CO₂ equivalent emissions from transport in the same year = 97.4 MtCO_{2e}

This equates to an average annual CO₂ emission per vehicle of 2.55 tonnes

Removing two million cars with this average emission equates to a total saving of 5.1 MtCO_{2e}

Objective(s)

The gas networks have defined objectives against which the success of the project will be measured against:

- Design amendments to the existing market frameworks to create an investable commercial structure that provides producers and shippers with the assurances necessary to commit their own investments to hydrogen blending projects
- Create a full, sequenced, and detailed Operational Readiness Implementation Plan that outlines the activities necessary to ensure that the network is ready on time for the injections to occur by early-stage hydrogen projects.
- Ensure that the identified market framework modifications and required operational readiness changes create a fair and efficient environment consumers and market participants.

Building upon the successfully delivered Planning phase in 2023, the 2A Design phase aims to collaboratively develop two key

deliverables:

1. Market Frameworks Blending Delivery Model = a report containing the full suite of modifications (with supporting evidence, options analysis, and rationale) required to the range of documents/regulations across the GB gas networks market frameworks hierarchy.
2. Operational Readiness Implementation Plan = driven by the recommendations from the Market Frameworks Blending Delivery Model and safety evidence, a full project plan containing the sequenced activities that require completing by the gas networks in order to achieve 'blend ready' status.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

The gas networks have completed an assessment of the distributional impacts (technical, financial, and wellbeing related) for this project using the bespoke assessment tool. The bespoke assessment tool may evaluate a project as having either a positive, negative, or neutral effect on consumers in vulnerable situations, and defines the scope of impacted consumers as those within the Priority Services Register (PSR) needs codes. After utilising the bespoke assessment tool to evaluate the project's impact, the gas networks have assessed a neutral effect on consumers in vulnerable situations.

Although a neutral impact has been evaluated, the gas networks will work with KPMG to ensure that the effects on consumers in vulnerable situations are considered when optioneering market framework and operational readiness changes. Furthermore, the current UNC modifications process dictates that both proposers and industry must consider any code change's consumer benefits (e.g. improved safety and reliability, lower bills than would otherwise be the case, improved quality of service etc.).

Success Criteria

The success of this project will be measured through the following metrics:

- The gas networks will produce a Market Frameworks Blending Delivery Model that details the design of the regulatory modifications required to enable hydrogen blending.
- The gas networks will develop a full Operational Readiness Implementation project plan containing the sequenced activities that need to be completed in order to achieve 'blend ready' status.
- Overarchingly, both the Market Frameworks Blending Delivery Model and Operational Readiness Implementation Plan will be designed in a manner that is fair, investible, and attractive to the full range of industry actors.

Project Partners and External Funding

The four GB gas distribution networks – Cadent, NGN, SGN and WWU, and National Gas Transmission are collaborating to deliver the project. The gas transporters have commissioned the services of KPMG to support the delivery of the project. The project will be solely delivered through the Network Innovation Allowance, and no other funding sources will be utilised.

Potential for New Learning

The project offers the gas networks multiple opportunities for new learning, the outputs of which will be shared as per the NIA governance document:

1. Hydrogen producers will be engaged as part of the Project Pipeline workstream and will help shape the deliverables of the Market Frameworks and Operational Readiness workstreams to ensure that they are attractive and investible. This engagement with producers will offer the gas networks the opportunity to further understand their drivers and risks (e.g. certainty of capacity allocation and risk of curtailment) – learning that can be retained and transferred to 100% hydrogen projects.
2. One of the main market framework mechanisms that the gas networks believe will require modification are the rules that govern connections and entry capacity. The gas networks currently provide entry capacity to connectees (such as biomethane producers) and are able to design and deliver reinforcement solutions in scenarios where there is not sufficient capacity. Although further work is required as part of the project to understand this scenario in more detail, the gas networks believe that entry capacity allocation will need to be managed differently for hydrogen blending – e.g. there will be volume and CV capping limitations which may result in connectees competing for capacity. The solutions to these issues will provide learning that will help shape the approaches taken by industry when addressing entry capacity management on 100% hydrogen networks.

3. Many of the current Market Frameworks are based on the principle of methane flowing from upstream to downstream, or from 'Beach to Meter'. This principle is built upon the historic concept of gas entering the NTS at onshore terminals, travelling through the NTS to LDZ offtakes, and then through an LDZ to exit at domestic/industrial users' meters. Hydrogen Blending will introduce localised gas production and the need to manage new system entry points into the GB Market Frameworks. The solutions that this project designs to facilitate these new principles can be applied by the gas networks to future work such as 100% hydrogen networks.

Scale of Project

The project will design the Market Framework modifications and Operational Readiness activities necessary to facilitate hydrogen blending at an industry wide scale. Although DESNEZ are yet to confirm their position in relation to support for NTS-level blending, the project's scope also includes blending within the transmission system. We believe that including NTS-level hydrogen blending within the scope of the project to be reasonable, as many LDZ-level blending decisions have interactions/dependencies with the NTS. Furthermore, the gas networks are aware of the EU decision to support hydrogen blending in countries connected to GB interconnectors, and as such, work at pace (ahead of a positive DESNEZ policy decision) may be required to ensure that the NTS is able to accept blended gas from Europe.

As stated earlier in the PEA, the gas networks believe there to be benefits to developing a uniform set of rules, policies, and processes that would apply consistently across all GB network areas (save for justifiable geographic differences). This approach would create

certainty, predictability, and fairness for industry participants, particularly those involved in the blending value chain across multiple LDZs. Conversely, there would be the potential for inconsistent and unequitable rules that industry participants would be subject to, should the gas networks have taken the approach to deliver the project on a smaller scale.

Evidence from the HyDeploy project suggests that significant environmental benefits can be realised through blending low carbon hydrogen with methane. If applied at a national scale, it is estimated that hydrogen blending could generate the same carbon saving benefits as annually taking two million cars off the road, approximately 5.1 MtCO₂e in equivalent greenhouse gas emissions savings

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

This is a national piece of work that will be applicable to all GB gas networks.

Revenue Allowed for the RII Settlement

N/A

Indicative Total NIA Project Expenditure

	External	Internal	Total
Cadent	£410,671.80	£102,667.96	£531,339.76
SGN	£205,331.28	£51,332.82	£256,664.10
NGN	£102,665.64	£25,666.42	£128,332.06
WWU	£102,665.64	£25,666.42	£128,332.06
NGT	£102,665.64	£25,666.42	£128,332.06
Total	£924,000.00	£231,000.02	£1,155,000.02

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:

As stated in the Scope section above, implementation of hydrogen blending within the GB gas networks could act as an important catalyst for the growth of low carbon hydrogen production. Through its qualitative assessment of the benefits of hydrogen blending, DESNZ has assessed that utilising the GB gas networks to enable hydrogen blending has a number of clear benefits, including:

- Mitigating volume risk for producers, thus enabling them to access lower cost financing and reduce the cost impact on consumers
- Enabling plants to maintain their production profiles, potentially reducing their production costs per MWh, which in turn should translate into a lower cost to consumers
- Reducing the levelised cost of hydrogen by increasing production load factors

Market Frameworks (such as the UNC) underpin the consistent rights and obligations of licenced actors in the GB gas industry, and modifications will be necessary to ensure that the rules for hydrogen blending are governed in a transparent, fair, and efficient manner. This project will facilitate collaboration between the GB gas transporters to develop a common set of modifications to the existing methane Market Frameworks that will enable use of the GB gas networks to transport hydrogen blended gas.

Additionally, gas networks will need to possess the skills, competence, assets, and processes to be able to safely transport hydrogen blended gas and comply with their Safety Cases. The project's Operational Readiness workstream will design a common approach across all networks to addressing the operational differences of managing a hydrogen blended network (versus methane).

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

Section not applicable – RIIO-2 project

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)

Section not applicable – RIIO-2 project

Please provide a calculation of the expected benefits the Solution

Utilising hydrogen blending as a technology to support the transition to Net Zero has several potential efficiency benefits, including:

- Reducing the risk of hydrogen production curtailment through acting as an offtaker of last resort when supply outweighs demand from 100% hydrogen users
- The findings from projects such as HyDeploy evidencing that minimal additional investment would be required in the GB gas networks' assets to transport hydrogen-blended gas
- Evidence suggests that domestic consumers (and a significant proportion of industrial and commercial consumers) would not

need to upgrade their appliances to safely utilise hydrogen blended gas

As well as delivering immediate efficiencies, the implementation of hydrogen blending in the GB gas networks would provide a positive signal for further investment to support the transition to 100% hydrogen networks. . A DESNEZ report calculated that blending had the potential to reduce enduring hydrogen production, transport, and storage costs between 2.4% – 2.9%, creating a financial benefit that could offset the initial investment required to ensure gas network infrastructure is blend-ready.

As referenced above, evidence from the HyDeploy project suggests that significant environmental benefits can be realised through blending low carbon hydrogen with methane. If applied at a national scale, it is estimated that hydrogen blending could generate the same carbon saving benefits as annually taking two million cars off the road, approximately 5.1 MtCO₂e in equivalent greenhouse gas emissions savings.

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

All four GB gas distribution networks (GDNs) and National Gas Transmission are included within the scope of the project. The Independent Gas Transporters which predominantly connect downstream of GDNs are not included in the collaborating parties but will be engaged as a key stakeholder in the Market Frameworks workstream.

Therefore, replication of the project's methods will principally be in the form of a subsequent Delivery phase, where the GB gas transporters will implement the Market Frameworks and Operational Readiness changes designed as part of this project.

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

The costs of developing the designs of Market Frameworks and Operational Readiness changes are included in the costs of this NIA project. Additionally, engagement activities with stakeholders such as gas shippers, independent gas transporters, gas producers, interconnectors, Ofgem, and DESNEZ are included in the costs of the project. This stakeholder engagement will ensure that both A) the project's deliverables are holistic and robust, and B) the methods developed as part of the project are naturally shared with industry.

The GB gas networks will have the option to enter into a 2B Delivery phase following the successful completion of this project. The 2B Delivery phase will predominantly focus on implementing the Market Framework modifications and updating the Operational Readiness processes designed in this project. Whilst the costs of the 2B Delivery phase are currently unknown, DESNZ suggested in their 2023 consultation document, that the infrastructure costs for each blending injection point would be in the range £1,015,000 to £2,503,000, with an ongoing annual OPEX cost of approximately £37,000. The gas transporters will also need to consider the code administration costs associated with the required UNC modifications, with the full extent of the costs to be confirmed as part of this Design phase project.

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 trialed 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

All licenced GDNs and National Gas Transmission are collaborating as part of this project and will have immediate access to the learnings and deliverables. The collaborating gas transporters will be able to use the project's learning to inform the Market Framework modifications and Operational Readiness activities required to facilitate hydrogen. Ultimately, the learning will be used by the network licensees to inform the delivery of industry changes that enable network companies to safely, economically, and efficiently manage the transportation of hydrogen blended gas.

Furthermore, the project's delivery will include multiple engagement opportunities with stakeholders such as gas shippers, independent gas transporters, gas producers, interconnectors, Ofgem, and DESNEZ. This engagement will allow the gas transporters to sense check their findings against expert stakeholders and disseminate learning to wider industry.

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.

The four GDNs and National Gas Transmission all play an active role in decarbonising the gas industry and therefore have a full awareness of hydrogen projects being delivered by other industry parties. This project has been developed collaboratively across all five gas network operators and previously coordinated through the Energy Networks Association. Resultingly, the gas transporters have a thorough understanding of other hydrogen initiatives and are not aware of any duplicate work.

Similarly, National Gas Transmission have worked with the Joint Office of Gas Transporters to chair a UNC hydrogen blending review group for the past several years. The group has been well attended by stakeholders such as DESNEZ, Ofgem, shippers, interconnectors etc. and has become one of the leading hydrogen blending forums in the industry. The gas transporters have used this forum to communicate their intention to deliver this project to industry and will continue to use the review group as an engagement tool, ensuring the risk of duplication is mitigated.

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

Section not applicable

Additional Governance And Document Upload

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

n/a

Relevant Foreground IPR

The projects deliverables will consist of A) a Market Frameworks Blending Delivery Model, and B) an Operational Readiness Implementation Plan. It is not expected that either of these outputs will constitute by themselves, or will lead to the creation of, copyrightable intellectual property (IP), and therefore, there is no expectation of Foreground IPR being produced by the project.

Data Access Details

As referenced in the Data Quality and Measure Quality Statements above, the project will utilise robust and transparent processes for obtaining data and recording its sources. For instance:

- All data sources shall be filed in an archiving system, with access made available to stakeholders (subject to any confidentiality restrictions)
- Data measurement activities shall be conducted by appropriately skilled personnel from both the networks and KPMG, and recorded through robust project management controls
- Data testing will be conducted in a rigorous and robust manner (e.g. cross referencing across networks to eliminate abnormalities and through consistent methodologies etc.)

Data gathered as part of this project may be requested through:

1. 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.
2. Via Cadent's (as the lead network) Innovation website at <https://cadentgas.com/future-of-gas>
3. Via Cadent's (as the lead network) managed email mailbox futureofgas@cadent.com

The gas networks will explain any need to redact or anonymise any data (e.g. commercial sensitivity) as part of their response to any request for information.

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

All licenced GDNs and National Gas Transmission are collaborating as part of this project and will have immediate access to the learnings and deliverables. The collaborating gas transporters will be able to use the project's learning to inform the Market Framework modifications and Operational Readiness activities required to facilitate hydrogen. Ultimately, the learning will be used by the network licensees to inform the delivery of industry changes that enable network companies to safely, economically, and efficiently manage the transportation of hydrogen blended gas.

Furthermore, the project's delivery will include multiple engagement opportunities with stakeholders such as gas shippers, independent gas transporters, gas producers, interconnectors, Ofgem, and DESNEZ. This engagement will allow the gas transporters to sense check their findings against expert stakeholders and disseminate learning to wider industry.

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

DESNEZ were clear in their September 2023 "Hydrogen Blending into the GB Gas Distribution Networks" consultation document that a positive strategic decision on blending does not predetermine that any hydrogen would be produced or blended into the GB gas networks. Additionally, in its off-taker of last resort role, surplus hydrogen after serving 100% users would be required in order for blending to occur. There is, therefore, inherent risk in any work to prepare for and enable hydrogen blending, supporting the case for use of NIA funding on the project.

This project has been approved by a senior member of staff

Yes