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_NGN_451

Project Registration

Project Title

Hydrogen Farm of the Future

Project Reference Number

NIA_NGN_451

Project Licensee(s)

Northern Gas Networks

Project Start

February 2024

Project Duration

0 years and 10 months

Nominated Project Contact(s)

Innovation@northerngas.co.uk

Project Budget

£116,050.00

Summary

The roll out of a GB hydrogen backbone through the East Coast Hydrogen project is on the horizon, NGN is keen to ensure that communities that aren't directly on the planned routes will not be left disadvantaged.

The project will carry out a techno-market analysis of hydrogen technologies applicable to farming, forming farm energy archetypes and decarbonisation pathways for farming technologies through to 2050. The project will then carry out use case analysis, geographic scaling of opportunities and a benefits analysis, culminating in a final report and dissemination activities.

Throughout the project, the farming community in Yorkshire will be engaged at face-to-face events to test and refine project outputs, and to understand barriers and incentives required.

Third Party Collaborators

Cenex

Royal Agricultural Society of England

Nominated Contact Email Address(es)

innovation@northerngas.co.uk

Problem Being Solved

To support the government’s net zero ambitions, it is necessary for the UK’s gas networks to transition to hydrogen. There are already a number of large scale projects underway to begin introducing hydrogen to industrial, commercial and domestic consumers. One such project, East Coast Hydrogen, is a collaborative project between Northern Gas Networks, Cadent, and National Gas, which will see existing assets between Teeside and Humberside utilised to begin distributing Hydrogen across the North East of England.

Despite these large industry-wide projects, there is a risk that some more rural areas situated away from the major pipelines may not benefit as soon as would be preferred. In light of increasing fuel costs there is additional strain on farming communities, making it necessary for farmers to start considering alternative energy/fuel sources.

Method(s)

Northern Gas Networks are keen to promote hydrogen adoption to the farming industry in rural parts of their region that may not benefit from the East Coast Hydrogen project. The desired output is a feasibility study/research project that will consider the use cases for hydrogen on farms, including but not limited to: • On site hydrogen production/storage • Fertiliser production • Hydrogen vehicles • Domestic and industrial heating/energy) This study should conclude whether or not farms in the region are suitable candidates for early hydrogen adoption.

The following statements will outline how the project will meet the measurement and data quality objectives set out. This will include the mechanisms put in place to ensure the accuracy, integrity, relevance, reliability, and timeliness of the projects results.

WP1 – Market Assessment

In this work package a full market review via stakeholder engagement and a comprehensive literature review. Engaging with those key stakeholders within the industry will provide relevant information to the project with lived experience. Develop, test and analyse categories of different active farm sizes, settings and the accompanying energy needs. This real time data will be arranged into a set of clear farm energy archetypes that will come with key assumptions.

Hydrogen uses on farms will be assessed and detail out a roadmap from now until 2050 for each of the categories. In producing the final roadmaps, the combined estimated uncertainty from all use cases will be used as a benchmark expectation of agreement from which to judge to what level the assumptions can be trusted.

WP2 – Business case and geographic analysis

The archetypes set out in WP1 will be analysed and prioritised into groups using the Red, Amber & Green rating system, proving important when completing future work within the project. Viability ratings will be completed while producing the business case analysis of hydrogen production and distribution options.

WP3 – Benefits analysis and reporting

Stakeholder engagement conducted to understand farming attitudes and barriers to uptake. This data gathering exercise will be subjective due to the experiences of those within the room. To make this exercise most representative of the UKs farming sector as a whole the selection of stakeholders will be representative of the sector as a whole. The archetypes detailed in WP1 will accompany the decision-making process.

Proposed incentives for solution adoption will be provided within the final report of the project. The knowledge from the previous stages of the project will influence the decisions for the recommendations. The related projects benefits will be outlined with current prices and use the same assumptions consistent throughout the project.

Scope

In Scope:

- Market Assessment- Assess the market development and potential uses cases of hydrogen as an energy vector in farming
- Business case & geographic analysis- Assess the viability of specific hydrogen use cases and associated scale of demand in NGN territory
- Benefits analysis & reporting- Identify the barriers for uptake and the wider benefits of creating a hydrogen economy in farming communities

Out of Scope:

- Project will not include specific field trials and demonstration of any hydrogen technology

Objective(s)

Stage 1 - Market Assessment

- Complete market review via stakeholder engagement and literature review
- Develop, test and analyse categories of different farming sizes, setting and accompanying energy needs e.g intensive dairy and

arable versus mixed non-intensive family farming, lowland versus upland settings

- Assess categories such as fertiliser production, heating, industry processes, transport, for expected viability on or off-farm

Stage 2 - Business case and geographic analysis

- Prioritisation analysis of archetypes
- Business case analysis of hydrogen production and distribution options
- Analysis of how archetypes scale up geographically, extrapolated from Yorkshire sub-region

Stage 3 - Benefits analysis and reporting

- Stakeholder engagement to understand farming attitudes and barriers to uptake
- Proposed incentives for solution adoption
- Further research or demonstration requirements

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

The project looks to identify what opportunites are out there for those in the farming industry and the rural communities surrounding. Specifically targetting those who may be off grid and left behind during the energy transition. In order to support a just and fair transition, options for all of those within the UK must be explored further than previous work.

Success Criteria

Minimum success criteria (Must and Should):

- Focus on rural communities in NGN's licence area
- Consider how both the consumers and the network can benefit from hydrogen adoption in the farming communities
- Identify use cases for hydrogen in a farming environment
- Propose methods to incentivise farmers adopting hydrogen

Desirable criteria (Could):

- Engage with local farming associations
- Highlight specific areas/communities that could be suitable for hydrogen adoption

Project Partners and External Funding

Cenex

Royal Agricultural Society of England

Energy Innovation Centre

Total external costs: £89,600

Potential for New Learning

Project represents an opportunity to understand the emerging technological applications of hydrogen in a farming setting, archetypes of farming settings based on their energy use and techno-economic use cases for hydrogen.

These project outputs will be applicable beyond the NGN territory being examined and can be scaled up to fit the UK's needs.

Scale of Project

This project will be a desktop based feasibility study, covering the geographical area that NGN operate within in the North and North East of England.

The study will involve the compilations of reports and documentation that will be dissemintaed through various platforms.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL2 Invention and Research

Geographical Area

The project will be a desktop feasibility study that will be replicable across the UK, but the specific project outcomes will focus within NGNs geographical area in the North of England.

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

External project costs: £89,600

Internal project costs: £26,450

Total NIA Project Expenditure: £116,050

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:

The project will develop learnings that will support the farming community in transitioning away from fossil fuel use. Decarbonisation roadmaps for farm technologies will assist industry understanding of transitionary pathway.

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

The future of the gas networks are uncertain at this time, with the potential electrification for heating becoming the predominant energy source for heating a home. In the more rural and hard to reach areas of the country, those customers are in a unique position where they have a much more limited list of solutions available to heat their homes. The project looks to provide alternative approaches that will allow residents to transition to a greener alternative fuel source without making too many compromises.

The project will help better inform customers or industries who are off grid who have the potential to be left behind during the energy transition. Project learnings will inform on the suitability of the uptake of hydrogen as an alternative energy source to support the net zero transition.

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

N/A - Low TRL Project

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

The method the project looks to develop will be replicable across the UK, there will be archetypes developed that will be representative of typical farming situations within the UK. This will help with the project itself as to reduce the number of scenarios that we will be targetting but will also make the replication to a wider geographical area much easier.

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

The project is a feasibility study therefore is currently at a low level TRL, the final outcomes will outline potential costs for wider future rollout of the learnings/ideas.

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

Following the publication of the final report RASE will co-ordinate farmer engagement activities to provide feedback to the farming community. This will include a workshop or 1 day study tour to physically demonstrate the feasibility of hydrogen on farms. There will be two press release formats, a public facing release and a separate press release written specifically for farming press. The archetypes selected within the Yorkshire region will be as representative to the rest of the UKs farms, this will allow for learnings to be applicable across the UK.

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.

There will be no duplication of work, this project is taking a novel approach to the possibilities of hydrogen for use in the farming industry. To the best knowledge there has been no previous work covering the topics of this project.

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 project is innovative as it looks at entirely novel applications of hydrogen and the gas network in how they can potentially benefit the farming industry. The technologies and applications of such aren't currently at a high enough TRL for serious consideration by the industry themselves to be using them currently. This will predominantly look at what the future may look like.

Relevant Foreground IPR

The project and the resultant outcomes/deliverables will conform to the default treatment of IPR as set out under the agreed NIA Governance (where the default requirements address two types of IPR: Background IPR and Foreground IPR).

Data Access Details

For all data access requests, please follow the guidance set out in Northern Gas Networks Innovation Data Sharing Policy. https://www.northerngasnetworks.co.uk/ngn-you/the-future/our-funding/

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

The project looks to explore the future possibilities in a market where gas networks previously have had very little involvement, that alongside the low TRL level of the projects scope are beyond the remit of Northern Gas Networks business as usual activities. As GB starts to move towards the energy systems transition and look to achieve various net zero targets, there needs to be options for all of the population. There is a risk that the more rural areas and farming sectors could fall within this bracket, requiring further investigation to provide options.

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 is highly innovative and future-facing that supports Northern Gas Networks in supporting a sector that has previously had very little crossover due to the current landscape.

This project has been approved by a senior member of staff

☑ Yes