

NIA Project Registration and PEA Document

Date of Submission

May 2020

Project Reference Number

NIA_NGN_263

Project Registration

Project Title

Hydrogen Storage for Zero Carbon Fleet Transport

Project Reference Number

NIA_NGN_263

Project Licensee(s)

Northern Gas Networks

Project Start

May 2020

Project Duration

1 year and 11 months

Nominated Project Contact(s)

Sarah Cooper-Birkenhead

Project Budget

£86,867.00

Summary

Currently, there are no zero-emission vehicles able to fulfil the specific duty cycles associated with the NGN and WWU business operations.

However, NGN, WWU and Cenex have identified hydrogen as a potential zero-emission technology that could meet the demands of their field-based work requirements. Hydrogen is a nascent vehicle technology, with potential to fulfil the high-power requirements of the NGN and WWU fleet operations.

Nominated Contact Email Address(es)

innovation@northerngas.co.uk

Problem Being Solved

Northern Gas Networks (NGN) and Wales and West Utilities (WWU) operate a wide range of vehicle types with specific usage profiles and weight limitations with very high onboard energy demands. The vehicles used by NGN and WWU must be capable of: covering long-ranges; off-road travel; transporting heavy loads; power lighting and compressor systems; towing additional equipment and providing power to hand tools in remote locations. Battery electric vehicles are unable to perform these duties now, or in the foreseeable future.

Utility companies currently rely on small vans and other light commercial vehicles running on diesel engines. Diesel engines emit not only carbon dioxide and climate change inducing equivalent chemicals (CO₂e), but also produce air quality (AQ) pollutants. CO₂e and AQ emission are increasingly regulated against and there is a clear need for essential utility services to adapt to the changing vehicle emission regulations now and in the future.

Currently, there are no zero-emission vehicles able to fulfil the specific duty cycles associated with the NGN and WWU business operations.

However, NGN, WWU and Cenex have identified hydrogen as a potential zero-emission technology that could meet the demands of their field-based work requirements. Hydrogen is a nascent vehicle technology, with potential to fulfil the high-power requirements of the NGN and WWU fleet operations.

Through this project NGN, WWU and Cenex will better understand the vehicle duty cycle and power requirements of the NGN and WWU fleets with the aim of assessing the hydrogen refuelling station requirements needed to promote the development of zero-emissions utilities vehicles.

Method(s)

To enable NGN and WWU to better understand the feasibility of using hydrogen powered vehicles within their fleets Cenex will undertake an in-depth assessment of this fuel technology.

To achieve this Cenex will utilise their in-house Fleet Advice Tool, which simulates the operation of low emission vehicles over specific duty cycles. The Tool utilises real-world vehicle efficiency data collected over many years of working on large scale low emission and hydrogen projects for both UK and EU government-funded projects. The Tool requires specific fleet operational data as inputs to enable an accurate assessment to be carried out.

To collect such specific data Cenex will track up to 12 existing NGN vehicles and up to 12 WWU vehicles from a single depot to determine their daily journey profiles in the field. Several classes of vehicle will be tracked for a period of up to 12 weeks. Unlike most tracking devices, Cenex's vehicle tracking solution enables data to be recorded in 2-second intervals allowing for more accurate analyses to be undertaken.

In addition, NGN and WWU will provide Cenex with vehicle specification data and refuelling and mileage data for all fleet vehicles over a 12-month period.

Scope

Stage 1

Historical telematics data analysis: existing telematics data (e.g. vehicle location and driver performance) for NGN and WWU will be supplied to Cenex to allow for the initial analysis of the operational suitability of hydrogen within the NGN and WWU fleet operations, across the relevant networks. The analysis undertaken will be used to identify potential locations for hydrogen fuelling stations, which will be mapped against existing hydrogen and compressed

Stage 2

Vehicle tracking and modelling: A minimum number of 24 vehicles (12 at NGN and 12 at WWU) will be monitored for a minimum of 12 weeks. Existing Cenex models for small vans, LCVs, electric vehicles and hydrogen-powered saloons and small vans adapted to match NGN & WWU utilities vehicle specifications.

Stage 3

Hydrogen demand feasibility study and vehicle / HRS specification: existing HRS and hydrogen technology providers will be invited to participate in a 'mini-tender' process for a utility specific hydrogen vehicle demonstration trial.

Stage 4

Trial plan for demonstration HRS installation and hydrogen supply briefing: based on the information gathered in stage one and two, Cenex will compile a hydrogen demonstration planning document.

Objective(s)

Stage 1: Historical telematics data analysis

- Provision of existing telematics data (e.g. vehicle location and driver performance) for NGN and WWU over a 24-month period, across all network operations.

Stage 2: Vehicle tracking and modelling

- Installation and data capture of a minimum of 24 vehicles (12 at NGN and 12 at WWU) for a minimum of 12 weeks. Provision of vehicle specification data and refuelling and mileage data for all NGN and WWU fleet vehicles over a 12-month period. Adaptation of the Cenex Fleet Advice Tool to simulate utilities vehicles and a theoretical hydrogen powertrain solution

Stage 3: Hydrogen demand feasibility study and vehicle/ HRS specification

- Hydrogen vehicle demonstration 'mini-tender' sent out to HRS and hydrogen vehicle suppliers
- HRS specification and proposed locations maps

Stage 4: Plan for vehicle and HRS demonstration trial

- HRS and hydrogen vehicle demonstration project plan Hydrogen briefing document

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

- A hydrogen vehicle and HRS demonstration project plan
- Preferred locations for hydrogen refuelling facilities for depot-based demonstration plan
- Comparison of historic fleet data to extrapolate single depot-based assessment to wider fleet
- Consideration of whole system integration, i.e. likely locations for public HRS and potential for national gas grid-based refuelling stations if national gas grid network is converted to 100% hydrogen gas

Project Partners and External Funding

Northern Gas Networks

Wales & West Utilities

Cenex

Potential for New Learning

Currently there is

- No utility company vehicle specification for hydrogen powertrains exists.
- No depot-based assessment of the hydrogen storage and dispensing requirements for utility company vehicles exists.

This project will provide the fundamental analysis required to enable real-world trials for hydrogen technologies over the next three years.

Scale of Project

Cenex will utilise the collected journey data, along with the additional information provided by NGN to develop a hydrogen fuelling demand model for the selected NGN depot. This information will be used to generate a hydrogen refuelling station (HRS) plan suitable for future hydrogen vehicles trials.

Together, the hydrogen vehicle model, and HRS plan will be used to create a hydrogen vehicle demonstration plan for essential utilities field vehicles.

Technology Readiness at Start

TRL5 Pilot Scale

Technology Readiness at End

TRL6 Large Scale

Geographical Area

The project will take place within the Northern Gas Networks & Wales & WEST Utilities geographical boundaries.

Revenue Allowed for the RII Settlement

N/A

Indicative Total NIA Project Expenditure

External expenditure - £ 68,300

Internal expenditure - £18,567

Total expenditure - £86,867

Project Eligibility Assessment Part 1

There are slightly differing requirements for RII0-1 and RII0-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RII0-2 / RII0-1).

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 RII0-2 projects only)

Please answer **at least one** of the following:

How the Project has the potential to facilitate the energy system transition:

n/a

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 (RII0-1 projects only)

Due to this project being research one of the outcomes will be a greater understanding of the potential deployment of alternative refueling options for commercial vehicles to enable network operations to be under taken

Please provide a calculation of the expected benefits the Solution

This project is an initial research, feasibility and modelling study that will inform the future landscape of our fleet and operations. At this point in time a CBA is not practical however indicative figures show that expected financial benefits will enable a contribution towards a £1.1m saving in air quality and carbon savings throughout GD2.

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

This is relevant for all network licensees as will be based on model provided by NGN & WWU

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

Not yet clear, to be provided as a project output.

Requirement 3 / 1

Involve Research, Development or Demonstration

A RII0-1 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

RII0-2 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

Recent UK Government NetZero 2050 target will require zero-emission vehicles to be deployed across all industry sectors

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

Environment and Low Carbon

- ☒ Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

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.

Call for Innovation via EIC, has under taken Market Scanning also engagement with other GB GDNs and a thorough search of the SNP has confirmed no work is in place.

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

With an increasing focus on a Net Zero carbon footprint by 2050, Hydrogen Fuel Cell Technology has potential to enable NGN to understand the viability of alternative fuel for use on our commercial fleet, to enable network operations to be undertaken. This has not yet been researched to this scale upon the necessary future requirements this would have on the networks fleet demands.

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

Gas Network operations are currently undertaken utilising widely available combustion engines as part of BAU activities. The deployment of Hydrogen infrastructure and fleet is at this moment, uncertain. Therefore, the only funding source available to enable this

project to proceed is NIA, given the low TRL starting position of this project and its level of uncertainty. The project will enable the networks to have a clear understanding of requirements for the future of fleet.

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

The uncertainty surrounding the technical and commercial feasibility of alternative fuel, specifically for light goods vehicles, presents a commercial risk to NGN, that would be beyond its current risk appetite as such this project is required for understanding alternative fuel for fleet.

This project has been approved by a senior member of staff

☒ Yes