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NIA Project Registration and PEA Document

Date of Submission

Mar 2020

Project Reference Number

NIA_NGN_258

Project Registration

Project Title

Vehicle Transition - CNG

Project Reference Number

NIA_NGN_258

Project Licensee(s)

Northern Gas Networks

Project Start

March 2020

Project Duration

1 year and 0 months

Nominated Project Contact(s)

David Gill

Project Budget

£103,960.00

Summary

Northern Gas Networks are working towards having a net zero carbon footprint by 2050. A large part of NGN's current emissions come from their fleet of service vehicles, so in order to decarbonise the business, NGN are looking to convert a section of that fleet to use Compressed Natural Gas (CNG) rather than Diesel.

Nominated Contact Email Address(es)

innovation@northerngas.co.uk

Problem Being Solved

Northern Gas Networks are working towards having a net zero carbon footprint by 2050. A large part of NGN's current emissions come from their fleet of service vehicles, so in order to decarbonise the business, NGN are looking to convert a section of that fleet to use Compressed Natural Gas (CNG) rather than Diesel.

Running vehicles using alternative low carbon fuel sources come with challenges involving infrastructure, cost, and vehicle availability. NGN are looking to determine if making the investment in CNG is financially viable, and if CNG conversion has any downstream effects on the business. Our solution is to use innovative agent based fleet modelling combined with economic analysis to provide evidence on:

- The feasibility of converting various proportions of the NGN's vehicle fleet to CNG;
- The investment required to maintain current service levels;
- The optimal locations for CNG infrastructure investment.

By using a modelling approach, a wide range of circumstances can be tested in a sandbox environment, allowing a broader set of solutions to be investigated and ultimately greater confidence to be garnered on the end solution. Additionally, the key drivers of cost, unavailability and the optimal deployment of infrastructure investment can be generated.

Method(s)

The project aims to conduct analysis and create a model to help Northern Gas Networks understand the feasibility of investing in CNG

infrastructure for the purposes of converting industrial fleets operating in the area that NGN serve.

The project will be divided into three stages

Phase 1: Market Analysis and Environmental Review – Including Refuelling capability design review.

In this phase Frazer-Nash will conduct research to understand and summarise:

- A design and technology review for options to connect CNG refuelling infrastructure to gas networks at high, medium and low pressures.
- The evidence for environmental, cost and air quality benefits of CNG when compared with other fuels.
- The economic and engineering features/restraints of different refuel technologies available to deploy.
- Research potential regional partners

Phase 2: Network and Transport Modelling

This activity will create an engaging simulation that simulates fleet activity over the geographical area of interest over a specified time. In the simulation, the user can specify how many vehicles are to be converted to CNG, and the simulation will monitor how the fleet behaves. Typical parameters that would be monitored are CO₂ emissions, cost, fuel status, and locations where refuel locations are required.

Phase 3: Business Case for Change

The business case for change will produce a report which builds on the work conducted in Phase 1 and 2 in order to produce costed options for deploying CNG vehicles that could be used to approach potential partner organisations, or inform investment decisions at NGN.

Overall, the project will be a success if the research and modelling completed as part of these three stages has increased NGN's understanding of the costs and implications of implementing CNG technology into their fleet.

Scope

Phase 1: Market Analysis and Environmental Review – Including Refuelling Capability Design Review.

In this phase Frazer-Nash will conduct research to understand and summarise:

- A design and technology review for options to connect CNG refuelling infrastructure to gas networks at high, medium and low pressures.
- The evidence for environmental, cost and air quality benefits of CNG when compared with other fuels.
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Phase 3: Business Case for Change

The business case for change will produce a report which builds on the work conducted in Phase 1 and 2 in order to produce costed options for deploying CNG vehicles that could be used to approach potential partner organisations, or inform investment decisions at NGN. The design and technology review (part of Activity 1) for connections at high, medium and low pressures will be an essential part of the Business Case for Change.

Objective(s)

Stage 1 Objectives – Market Analysis and Environmental Review – Including Refuelling Capability Design Review

Objectives of this task are to:

- Characterise the state of the CNG market in the region;
- Research and identify potential partners in the region;
- Characterise key features of the CNG technology to be used in the Stage 2 simulation;
- Conduct research in to CNG refuelling capabilities. Report on key aspects such as cost, refuel rate that can be used in the Stage 2 simulation.

Stage 2 Objectives – Network and Transport Modelling

Objectives of this task are to:

- Develop a digital model of key sections of NGN fleet. Initially, assuming all vehicles are conventionally fuelled, run the simulation, attending locations taken from past usage data provided by NGN.
- Modify some/all of the fleet to use CNG as a fuel source, monitoring how the system responds to the new vehicles.
- With the CNG vehicles in active service, monitor where vehicles require refuelling and use this information to inform refuelling capability placement.

Stage 3 Objectives – Business Case for change

Objectives of this tasks are to:

- Create a business case for change, which takes the commercial and technical research completed in Stage 1, and augments this

with the results of the simulation produced in Stage 2 to produce a business case for investing in CNG infrastructure.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project will be a success if the research and modelling completed as part of the three stages has increased NGN's understanding of the costs and implications (environmental and operational) of implementing CNG technology into their fleet.

Project Partners and External Funding

Northern Gas Networks
Frazer Nash Consultancy

Potential for New Learning

There are a number of opportunities for new learning from this work during and following project completion:

1. The method of using a mathematical approach for modelling the impact of converting fuel type of fleet vehicles has not been demonstrated in this way previously.
2. The fleet model can continue to be enhanced to focus on improving NGN's operational capability, improving efficiency of vehicle deployment and minimising response times.
3. The fleet model will allow NGN to make changes to their fleet in a no-risk environment thus providing an extra tool when making operational decisions.

As part of the output from Activity 3, alternatives refuelling methodologies may be identified that have not before been considered when refuelling similar fleets with CNG.

Scale of Project

The scale of this project will create a digital model of the NGN commercial fleet to simulate day to day operations. The vehicles in this digital model will be converted to CNG so that the downstream consequences of the change can be observed. The output of the model will create a business case for change to be created which will detail an economic assessment.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

The project will take place within Northern Gas Networks geographical boundaries.

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

£103,960

(external = £95,000)

(Internal Costs = £8,960)

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:

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 (RIIO-1 projects only)

The project has the potential to deliver wider financial benefits to the customer in form of more efficient and effective operational fleet fuel costs and associated reductions in operating expenditure. The project has potential to deliver findings that enable NGN to use alternative low carbon fuel to decarbonize the network operations and support the transition to a net zero carbon footprint by 2050.

Please provide a calculation of the expected benefits the Solution

The objective of this project is to research and create a model which will enable NGN to understand the costs and implications of implementing CNG refueling technology across our commercial fleet. The findings from this project will enable a robust Cost Benefit Analysis

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

The method would be fully replicable across GB to all network licensees to support a transition to a net zero carbon footprint by 2050

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

The project outputs and findings will provide the information required to evidence forecasted future investment costs

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

All utilities must meet a net zero carbon footprint by 2050. This project will determine if the investment into CNG is operationally sustainable, commercially viable and what is required to enable wider scale deployment.

The findings from this project can be shared with other GDNs.

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

The project is relevant to both Future of gas and 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.

A thorough check has been completed and no similar projects identified on the smarter networks portal. This project is also the result of a horizon scanning exercise and a 'Call for Innovation' facilitated via the EIC.

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, CNG Technology has potential to enable NGN to understand the viability of alternative fuel for use on commercial fleet, to enable network operations to be undertaken, which has not yet been researched to this scale.

Relevant Foreground IPR

n/a

Data Access Details

n/a

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

Gas Network operations are currently undertaken utilising widely available combustion engines as part of BAU activities. The deployment of CNG infrastructure and fleet is very uncertain and therefore the only funding source available to enable this project to proceed is NIA.

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