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

Apr 2024

Project Reference Number

NIA_WWU_02_59

Project Registration

Project Title

HyDrive

Project Reference Number

NIA_WWU_02_59

Project Licensee(s)

Wales & West Utilities

Project Start

April 2024

Project Duration

0 years and 10 months

Nominated Project Contact(s)

Eileen Russell

Project Budget

£423,371.00

Summary

This project will investigate the feasibility of hydrogen refuelling stations (HRS) being connected to the current gas network. This project will deliver a report detailing the key benefits under which scenarios that connecting a HRS to a hydrogen network provides advantages against the counterfactuals. These benefits will include key metrics such as the Levelized Cost of Hydrogen (LCOH), Gross Value Added (GVA), jobs created/retained. These metrics will also include cost to the consumer, should network costs be socialised under the expected Hydrogen Transport & Storage (T&S) business model.

Preceding Projects

NIA_WWU_2_02 - Regional Decarbonisation Pathways

NIA_WWU_2_19 - Integrated Hydrogen Transport Hubs

SIF_WWU_2_2 - Integrated Hydrogen Transport Hubs

Third Party Collaborators

Costain

Nominated Contact Email Address(es)

innovation@wwutilities.co.uk

Problem Being Solved

The UK Government's Energy White Paper (2020) has identified hydrogen as a potential source of decarbonised heat in buildings. In order to prove the viability of hydrogen the UK Government requires a strong evidence base before deciding whether to promote

hydrogen distributed in the existing gas network infrastructure (at all current pressures) to decarbonise heat. A number of different areas of evidence will be required to satisfy the use case for hydrogen including evidence on the feasibility, cost, convenience and safety of transporting 100% hydrogen.

The transport sector is responsible for a large proportion of carbon emissions. It is at the forefront of concern for many local authorities as they consider routes to net-zero. One solution being developed further is hydrogen FCEVs, which can be advantageous to the consumer as the refuelling process is similar to that of petrol and diesel cars today.

Development of infrastructure to support hydrogen vehicles will be a key part to any transition to new technologies that are developed to allow them to be rolled out at scale. This project looks to explore this potential, by first establishing a baseline for current demand that can be used to inform how further infrastructure could be developed.

Method(s)

This project will investigate the feasibility of Hydrogen Re-Fuelling Stations (HRS) being connected to the current gas network. The gas network has traditionally provided energy to homes, commercial business and large industry. This additional purpose for the gas network will create a new demand which we will need to forecast as we progress to a net-zero society.

The first stage of this project is to gather data from external sources through a targeted literature review, and to understand the current road transport demands within the areas served by our network. These demands will vary by location as we expect public transport to be more dominant in cities, whereas rural areas tend to rely on cars for transport and HGVs to be common in areas with more industry. The project will determine the current baseline model discretised on an hourly basis for an entire year. The hourly discretisation will aid us to understand future gas grid constraints attributed to additional Fuel Cell Electric Vehicles (FCEV) transport demands, and future electricity grid constraints attributed to additional EV transport demands. We expect transport demands and vehicle efficiency to vary seasonally for both hydrogen and electric vehicles.

Having determined the current baseline for transport demands we will shift our focus to the average energy efficiency of hydrogen vehicles by vehicle type and will conduct analysis to forecast future potential hydrogen demand on the network. The project will also consider the shift in future consumer behaviours and to what extent the following statements will be realised:

- The increased uptake in public transport.
- HGVs being replaced by hydrogen vehicles.
- The uptake of electric vehicles.
- Clean air zones have changed consumer behaviours.

The study will combine forecasted transport demand model and our forecasting model for future demands on the network to look at locations that will be well suited to a hydrogen refueller connected to the gas grid.

Analysis of adding a viable additional network connection will be undertaken. The project will study suitable pressure tier connections and identify locations in our network that are suitable for this additional transport demand. Furthermore, the study will consider the upgrades that are necessary to implement this increased demand on the network.

When the modelling is complete, the study will consider locations currently served by public and private petrol stations. The analysis will help to choose a suitable location for a petrol station conversion to a hydrogen refueller, considering both the need for HGVs, LCVs and small vehicle refuelling. This will require mapping of a pipeline from WWU's network to the chosen station.

A further expectation for this piece of work is to understand the economics of supporting this technology and how it will impact consumers in a future transition. The economics review required is to understand the major cost items associated with the siting of a HRS at the point of demand or preferred location.

Data and Measurement Quality

The project is rated low in the common assessment framework detailed in the ENIP document after assessing the total project value, the progression through the TRL levels, the number of project delivery partners and the high level of data assumptions. No additional peer review is required for this project.

Scope

Literature review and stakeholder engagement

- Undertake a consolidated literature review of industry and academia-led work in relation to the development of demand datasets for the transport sector.

- Seek opportunities to obtain data for use in the creation of the baseline demand profile.
- Summarise key findings and assess gaps.
- Assess linked projects detailed below to form a strong basis for the development of this scope further, and identify any other projects that this work could build on.

Demand and Data Collection

- Collect all relevant transport data and create a current baseline demand profile on an hourly basis per year across WWU's network based on publicly available data and using WWU's fleet as a case study.
- Collect data split by vehicle type.
- Split current demand data by local authority within WWU's network to allow for a case study to be selected from baseline data.
- Establish number of current petrol and diesel re-fuelling stations within WWU's network split by local authority.
- Establish type and owner of existing re-fuelling stations including both public and privately owned stations and identify key stakeholders associated with them.
- Construct a heat map of current petrol and diesel transport demands in Wales and Southwest England
- Establish where re-fuelling is considered rural or non-rural and where grid constraints could impact availability of EV Charging and H2 re-fuelling.

Analysis and Case Study

- Assess baseline demand data and recommend three preferred locations to undertake a case study and explore opportunities for project development.
- Analyse optimal pressure tier connections to WWU's distribution network at the preferred case study location (to be determined by WWU). Study a variation of pressure tier connections and demand loads to attribute to WWU's network analysis models.
- Carry out research to understand the likely potential future demands from hydrogen transport based on technology advances, progress on hydrogen vehicle efficiency and potential future consumer behaviours.
- Identify suitable locations for a HRS via existing petrol station conversion or new build case study on WWU's network
- Develop plan to physically connect refueller to WWU network including cost of connection. This should include CAPEX and OPEX cost estimation for the main elements of work to AACE Class 4 standard.

There is a lot of ongoing work to identify the most effective route to meet net zero in the UK and this project is one of many projects to evidence the major or minor role hydrogen will have in different scenarios. Repurposing the UK gas networks with hydrogen to support the challenge of the climate change act has the potential to save £millions with minimal gas customer disruption verses alternative decarbonisation solutions

The scope was increased slightly during the project to include an assessment of energy requirements for Battery Electric Vehicles.

Objective(s)

Investigate the feasibility of hydrogen refuelling stations (HRS) being connected to the current gas network.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

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

This project has been assessed as having a neutral impact on customers in vulnerable situations

Success Criteria

A successful project will allow WWU to understand a baseline for current demand that can be used to inform how further infrastructure could be developed.

Project Partners and External Funding

Project partners are Costain, the project is wholly funded via NIA

Potential for New Learning

A report detailing the key benefits under which scenarios that connecting a HRS to a hydrogen network provides advantages against the counterfactuals. These benefits will include key metrics such as the Levelized Cost of Hydrogen (LCOH), Gross Value Added

(GVA), jobs created/retained. These metrics will also include cost to the consumer, should network costs be socialised under the expected Hydrogen Transport & Storage (T&S) business model.

Scale of Project

As this is the first stage of the project it is a desktop study, which is the required scale at this time,this ensures that we are able to develop the initial valuable learning to assess feasibility and enable planning for later iterative project phases.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

This is a desktop study, so work will be carried out on the offices at Costain

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

External Expenditure: £ 317,528. Internal Expenditure: £105,843. Total: £423,371.

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 transport sector is responsible for a large proportion of carbon emissions. It is at the forefront of concern for many local authorities as they consider routes to net-zero. One solution being developed further is hydrogen Fuel Cell Electric Vehicles (FCEVs), which can be advantageous to the consumer as the refuelling process is similar to that of petrol and diesel cars today.

Development of infrastructure to support hydrogen vehicles will be a key part to any transition to new technologies that are developed to allow them to be rolled out at scale. This project looks to explore this potential, by first establishing a baseline for current demand that can be used to inform how further infrastructure could be developed.

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

n/a

Requirement 2 / 2b

Has the potential to deliver net benefits to consumers

Project must have the potential to deliver a Solution that delivers a net benefit to consumers of the Gas Transporter and/or Electricity Transmission or Electricity Distribution licensee, as the context requires. This could include delivering a Solution at a lower cost than the most efficient Method currently in use on the GB Gas Transportation System, the Gas Transporter's and/or Electricity Transmission or Electricity Distribution licensee's network, or wider benefits, such as social or environmental.

Please provide an estimate of the saving if the Problem is solved (RIIO-1 projects only)

N/A

Please provide a calculation of the expected benefits the Solution

There is a lot of ongoing work to identify the most effective route to meet net zero in the UK and this project is one of many projects which will assist in this area. Repurposing the UK gas networks with hydrogen to support the challenge of the climate change act has the potential to save millions of pounds with minimal gas customer disruption verses alternative decarbonisation solutions. The project will explore whether low-regrets infrastructure investments be made now to ensure that unnecessary costs aren't incurred in the future by developers or consumers.

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

The findings will be relevant to all networks across GB

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

This is a desktop study, so roll out costs are not considered at this time.

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

This is an issue that affects all networks, so the findings can be used by all networks

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.

All networks have been made aware of this project and no concerns of duplication have been raised

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

Limited work has been undertaken that investigates how the gas network can be used to support hydrogen refuelling stations. Hydrogen vehicles in themselves are at a fairly immature level, so this project is truly innovative as it explores the infrastructure for vehicles that are currently not widely used.

Relevant Foreground IPR

The reports published as part of the project will form the foreground IP

Data Access Details

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

- A request for information via the Smarter Networks Portal at https://smarter.energynetworks.org, to contact select a project and click 'Contact Lead Network'. WWU already publishes much of the data arising from our innovation projects here so you may wish to check this website before making an application.
- Via our Innovation website here
- Via our managed mailbox innovation@wwutilities.co.uk
- Details on the terms on which such data will be made available by Wales & West Utilities can be found in our publicly available "Data sharing policy relating to NIC/NIA projects" here

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

Ofgem published its final determinations which included a variety of provisions to enable necessary development work on Net Zero projects but also to ensure vulnerable customers are thought about in any decision making. This project has the potential to facilitate the energy system transition and is therefore eligible to use the NIA funding mechanism.

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 project would only be undertaken with support from NIA funding, it is in the interests of gas customers, the regulator and the UK government and the realisation of any benefits are outside the control of the gas networks. There is no allowance in BAU business plans for this type of work and there is a risk that if hydrogen is not accepted as a means for transport in 2050 that this work is no longer valid

This project has been approved by a senior member of staff

☑ Yes