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

Oct 2022

Project Reference Number

NIA_WWU_2_16

Project Registration

Project Title

Hydrogen for Industrial Estate Heating

Project Reference Number

NIA_WWU_2_16

Project Licensee(s)

Wales & West Utilities

Project Start

November 2022

Project Duration

0 years and 3 months

Nominated Project Contact(s)

Iain Morley

Project Budget

£63,608.00

Summary

WWU is aware of relatively new Thermal Plasma Electrolysis technology to create hydrogen from a specific provider that has a small footprint and on demand usage. The technology utilises novel processes for carbon capture and can be applied in remote locations that have a natural gas supply. It is necessary to understand on an individual building scale what the possibilities of applying this technology are, if hydrogen can be utilised for this type of building and what the associated land and building requirements may be.

This project will undertake a feasibility study to understand integrating thermal plasma electrolysis technology in relation to industrial units via assessment of typical demand for a range of use cases. current methods of heating with associated costs, and a case study for the implementation of the technology into a representative industrial unit with potential expansion to an entire industrial estate and application of use across other areas e.g., transport.

Nominated Contact Email Address(es)

innovation@wwutilities.co.uk

Problem Being Solved

The UK government has committed to reducing greenhouse gas emissions to net zero by 2050 with the Scottish government targeting net zero by 2045. All future energy modelling identifies a key role for hydrogen in providing decarbonised energy for heat, transport, industry and power generation. Significant decisions on the future of UK heat policy are expected from the UK government in 2026 so the need for further evidence to influence these decisions is of critical importance.

There is a need to undertake evidence gathering to understand how to heat an operational facility/warehouse in a cost effective, yet low carbon way in the near-term, avoiding the risk of waiting for larger scale decarbonisation to reach these geographical locations away from major infrastructure.

Method(s)

Heating an operational facility/warehouse in a cost effective yet low carbon way is needed to help achieve the UK's Net Zero targets. New developments to house small and medium sized businesses are already becoming dependent on heating and power consumption being carbon neutral to gain planning permission.

With the vast array of work going on within the industrial clusters, aimed at decarbonising heavy industry, the industrial estate landscape runs the risk of being left behind and falling further down the decarbonisation priority list.

WWU is aware of relatively new Thermal Plasma Electrolysis technology to create hydrogen from a specific provider that has a small footprint and on demand usage. The technology utilises novel processes for carbon capture and can be applied in remote locations that have a natural gas supply. It is necessary to understand on an individual building scale what the possibilities of applying this technology are, if hydrogen can be utilised for this type of building and what the associated land and building requirements may be.

This project will undertake a feasibility study to understand the following aspects of integrating thermal plasma electrolysis technology:

1.Assessment of demand for a typical industrial unit for a range of use cases
2. Current methods of heating typical industrial units, with associated CAPEX and OPEX costs
3. A case study for the implementation of thermal plasma electrolysis technology into a representative industrial unit to identify requirements for:
4. Hydrogen heating solution technology
5. Ancillary technology such as control instrumentation and storage
6. Natural gas and electricity supply
7. Design constraints including system footprint, proximity distances, and utilities
8. CAPEX and OPEX costs for system build and operation (incl. major civils)
9. Assessment of benefits (carbon saving, financial and other) against reasonable comparisons
10. Commercial opportunity associated with carbon black biproduct

Potential expansion of the unit to provide enduring hydrogen for heating for an entire industrial estate and application of use across other areas e.g., transport.

Data quality statement
Apollo verify and validate data through multiple sources. Any vendor or OEM data used will be clearly attributed to source. All assumptions will be clearly documented within the report. Any potential data quality issues will be clearly stated. Data will be stored and protected within Apollo's electronic document management systems which is Cyber Essentials compliant, ensuring protection and privacy of data.

Measurement quality statement
The study basis of scope (design) sets out and references all potential project data sources. These are approved by competent resource before further assessment is undertaken by the project. Any data generated by the project is subject to Apollo's checking and approval process as defined in Apollo's integrated assurance manual 006-004-002H.

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 medium level of data assumptions. No additional peer review is required for this project.

Scope

Current status quo: An assessment of the demand for a typical industrial unit for a range of use cases will be completed. This project will focus on the use of gas as an energy vector. It is envisaged that there will be three use cases, which will be defined during the initial project setup and related to demand profile. The use case will be described and high-level gas usage data obtained. This will be documented within the study report deliverable and will inform the next task to review the current heating technologies.

The use cases will form a series of scenarios that will help to form the basis of the high-level CAPEX and OPEX evaluation. The study will capture the full range of technologies.

To appraise the current methods/technologies the following will be highlighted:
1. Description
2. Key elements
3. Pro/cons
4. CAPEX and OPEX based on up to three scenarios

New technology appraisal: A high level market engagement exercise to review current thermal plasma electrolysis technology to capture key elements to feed into the case study. This will include the following:
1. Initial vendor conversation
2. Likely NDA and detailed information sharing
3. High level appraisal of commercial readiness

Case study: Collating the information from the previous two tasks, a case study will be developed based on a current industrial unit requirement.

As per the scope the following will be detailed:
1. Technology requirements for a hydrogen heating solution
2. Requirements for ancillary technology such as control instrumentation and storage
3. Natural gas and electricity supply requirements
4. Design constraints including system footprint, proximity distances, and utilities
5. CAPEX and OPEX costs for system build and operation (incl. major civils)
6. Assessment of benefits (carbon saving, financial and other) against reasonable comparisons
7. Commercial opportunity associated with carbon black biproduct.

Expansion opportunities: Following the case study development, a review of the ability for the potential expansion of the technology to provide enduring hydrogen for heating for an entire industrial estate alongside exploring application of use across other areas e.g., transport.

For this task two high-level cases will be analysed:

1. Discrete system for each of the estate users i.e. can be upscaled as appropriate across an entire estate
2. Single unit to provide hydrogen to the entire estate user base

Expansion opportunities will also be looked at with regards to other users for example transport, and what supplementary infrastructure would be required to facilitate. Specifically where transport might require additional compression/storage.

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

Objective(s)

To investigate the feasibility of new Thermal Plasma Electrolysis technology to create hydrogen that has a small footprint and on demand usage, which could be used to heat buildings on industrial estates

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

Success will produce a report detailing the assessment of demand for a typical industrial unit, as well as reviewing current methods of heating typical industrial units and associated costs

Project Partners and External Funding

Project Partners: Apollo engineering. The project will be wholly funded via NIA

Potential for New Learning

Whilst the Industrial Cluster Challenge addresses heavy industry and power, smaller industrial estates may be left behind – unable to progress with decarbonisation due to market limitations. This project addresses this up-front through the application of thermal plasma

electrolysis technology which has not before been explored in the context of suppling a smaller cluster of I&C users.

Through case studies, the work will be applicable to archetype industrial estates found across the UK, giving GDN's the opportunity to work with technology providers in addressing hydrogen demand in these areas.

Work will be disseminated formally through existing working groups and informally through press articles as thinking develops.

Scale of Project

This will be a desktop study, which is the appropriate scale for this project. This allows networks to assess the impacts of the findings before deciding if further work is needed in this area.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

The project is applicable to the entire GB network

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

External Costs: £47,706
Internal Costs: £15,902

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:

There is a need to undertake evidence gathering to understand how to heat an operational facility/warehouse in a cost effective, yet low carbon way in the near-term, avoiding the risk of waiting for larger scale decarbonisation to reach these geographical locations away from major infrastructure.

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

This is a research project

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

The findings from the project will be relevant to the entire UK

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

This is a research project, roll out costs are not currently available.

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

The challenge of heating an operational facility/warehouse in a cost effective, yet low carbon way is relevant to 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

This is new technology that has not yet been fully investigated for this type of use case.

Relevant Foreground IPR

The project will produce a report which forms the foreground IPR

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 - https://www.wwutilities.co.uk/about-us/our-responsibilities/innovation/
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” on our website https://www.wwutilities.co.uk/about-us/our-responsibilities/innovation/

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, while also keeping vulnerable customers front and centre of our thinking 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 to heat homes in 2050 that this work is no longer valid.

This project has been approved by a senior member of staff

☑ Yes