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

Aug 2024

Project Reference Number

NIA_WWU_02_25

Project Registration

Project Title

Sensitive I&C Users for Strategic Hydrogen Network Planning

Project Reference Number

NIA_WWU_02_25

Project Licensee(s)

Wales & West Utilities

Project Start

September 2024

Project Duration

0 years and 6 months

Nominated Project Contact(s)

James Pugh

Project Budget

£117,640.00

Summary

A variety of work has been undertaken to date to understand the readiness of I&C customers, but little work has been done to understand the strategic impact which this may have on how the gas networks should plan for the delivery of hydrogen (including a hydrogen blend) to domestic customers whilst maintaining sufficient network resilience for I&C users.

We therefore need to be able to undertake network planning for the delivery of hydrogen to domestic customers, whilst considering site sensitivity and any behind the meter investment required by I&C customers to ensure hydrogen readiness.

This project will inform network planning for the delivery of hydrogen to domestic customers, whilst considering site sensitivity and any behind the meter investment required by I&C customers to ensure hydrogen readiness.

Preceding Projects

NIA_WWU_2_02 - Regional Decarbonisation Pathways

NIA_WWU_2_17 - Lessons from the Past: What can we learn from past energy transitions in the Gas Industry

Third Party Collaborators

Costain

Nominated Contact Email Address(es)

innovation@wwutilities.co.uk

Problem Being Solved

A ‘sensitive user’ is defined as ‘An existing I&C or power generation customer which is connected to the distributed gas network, whom may be impacted by either a blend or conversion of the existing network to hydrogen.’

Little work has been done to understand the strategic impact which this may have on how the gas networks should plan for the delivery of hydrogen (including a hydrogen blend) to domestic customers whilst maintaining sufficient network resilience for I&C users.

We therefore need to be able to undertake network planning for the delivery of hydrogen to domestic customers, whilst considering site sensitivity and any behind the meter investment required by I&C customers to ensure hydrogen readiness.

This is needed to inform networks on how to plan for a transition to hydrogen and focusses on the short-medium term rather than the long term or end-state of the future energy system.

Method(s)

This project will aim to deliver against six key areas. The core of this work will be desktop based, although user engagement will require site visits to inform the case studies.

Firstly the project will undertake a literature review to understand the extent of I&C work to date, and what learning can be applied within this study. This will include a deep dive into the ‘Lessons learned from the past’ project recently published by WWU (NIA_WWU_2_17) and other linked projects.

The project will utilise an engagement questionnaire created under a UIOLI project to directly engage with I&C customers (including power generation). This will help make informed decisions based on requirements such as total energy usage, net a zero plans already in place, what does their processing involve etc. This will also help us understand:

1. Any major sensitivities or ‘showstoppers’ for the conversion of each sites’ local network to hydrogen or a hydrogen blend.
2. The extent to which customers are wishing to develop their sites, and whether they are likely to remain as a gas consumer and convert to hydrogen/deploy Carbon Capture, Usage and Storage (CCUS), or decarbonise through an alternative means (e.g. electrification).
3. The level of hydrogen knowledge amongst I&C customers and how to maintain engagement throughout the transition.
4. What assumptions need to be made about sites which have not responded to the engagement tool.
5. Further assessment of sites with major sensitivities from (a.) in the form of two case studies.

The project will then understand which customers will need to manage hydrogen blending impacts on their operations (e.g., through installing deblending equipment) during the rollout of hydrogen or a hydrogen blend, by creating a list of practical challenges I&C customers are likely to encounter, specifically relating to making these plans happen. This will be based upon WWU’s ‘Regional Decarbonisation Pathways’ (NIA_WWU_2_02) project and known hydrogen production areas that have become known since the project.

We will then geographically map sensitive users (by sector and by type) onto the existing distribution network using GIS software. Creating a central data platform that will enable the flexible visualisation of layers developed from the available data. Then analyse the results of customer engagement and depending on the geographical spread and level of detail provided across different sectors, plan to visit three operating sites. This will provide a deeper dive into some of the specific issues relating to implementation, accounting for technical, operational and regulatory requirements. This will inform how and what consideration can be made of these customers in terms of strategic network planning and network conversion. The Risk Review will present each risk and identify which risks apply for sub-groups of customers.

Finally, the project will aim to understand the impact of these customers in terms of conversion timescales, with a view toward a Town Pilot conversion to hydrogen. Conversion to hydrogen would be expected to take several years across the region, with the concept of a mandated change not favoured at present. Alongside the practical challenges of network conversion, the availability of resources, both physical (steel, concrete and equipment) and trained personnel. A conversion timescale risk register will be produced, building on earlier work within the project on the customer sensitivities and practical challenges. This will include:

- Description of potential issues
- Impact on conversion time
- Cost of mitigation

Data Quality Statement

In delivering the scope of the Sensitive I&C Customer project we will ensure that data captured is recorded, managed, checked, stored and archived in accordance with the general principles detailed in Ofgem’s Data Best Practice and Data Assurance guidance documents and the RIO-2 NIA Governance Document.

The Project Execution Plan (PEP), developed at project award will set out, establish and document our approach to include our procedure for checking and approval; confidentiality and GDPR requirements for data handling; raw data storage, format, and management; and data archiving and accessibility procedure.

Analysis and interpretation of results and recommendations, input and output data and models will be passed to Wales & West Utilities at project completion for custody, to support subsequent phases and for audit.

The use of graphics and infographics will improve accessibility of the final Report for those from a non-technical background.

Measurement Quality Statement

Data used in the analysis of current/baseline analysis will mainly consist of customer data and perspectives in Wales and South-West England. We will use also data from government, followed by peer reviewed technical papers, guided by data from stakeholder engagement.

Throughout the project we will record where assumptions were needed to address gaps in available data, to make clear the methodology we have used.

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

Based on the results of a deep dive into 'Lessons learned from the past' (recently published by WWU) we will then present a full list of data sources and projects (from the linked project list and beyond) and produce key initial findings. This includes lessons learned from the historic conversion of the gas network at the time from town gas to natural gas in the 1960s and 1970s. We will also carefully review the linked projects (as identified in the project scope document), to build on work already carried out. We will also identify other relevant ongoing projects and include the findings of this in the Literature Review. Previous work, for instance on boiler compatibility, will help us to understand customers who are sensitive to a 20% blend of hydrogen, or 100% hydrogen, or are sensitive to natural gas having converted to hydrogen. Existing work reviewed will provide a strong baseline for the project before we progress with customer engagement in the Wales & West region.

Engagement tool review and customer engagement

We will review the content of WWU's 'Industrial Infill Methodology' engagement tool. We propose to review the content of this with WWU, potentially making additions and adjustments, before engaging sensitive I&C customers. Using an online questionnaire (using Qualtrics) would be a key aspect here.

Customer meetings

8 online group workshops with customers and 5 meetings on a 1-2-1 basis, and 3 in-person site visits. Workshops with multiple attendees are assumed to be primarily organised via an existing industry group such as Hydrogen South West. We will summarise these in a brief engagement plan. We will target customers already engaged with energy transition and in particular hydrogen as a priority for case study candidates. To encourage deeper insight from key sensitive customers, a total of three operating sites will be targeted for site visits and on-site engagement days. As a priority, one of these should be generating electricity. The results of customer engagement will be used to validate the findings of the literature study, to create 2 case study documents, and to understand the overall picture regarding decarbonisation of I&C customers and their potential conversion to hydrogen for heat and power. It is assumed that WWU will provide a list of customer contact details.

Understanding customer requirements (sensitivities and plans)

We will take time to understand the appetite of customers to decarbonise through hydrogen, CCUS and electrification and their current level of knowledge. Through customer engagement, we will develop an understanding of key customer sensitivities to hydrogen.

Through consultation with customers representing key sectors, and desktop research for the literature review, we will develop a list of practical challenges facing customers dealing with hydrogen sensitivities. Once we have developed a consolidated view of customer sensitivities that has been internally reviewed, we will look to share this externally with WWU to sense check the findings. This will aid understanding of which customers will need to manage hydrogen blending impacts on their operations (e.g., through installing deblending equipment) during the rollout of hydrogen or a hydrogen blend. To move beyond a list of sensitivities to understand

practical challenges we will develop a risk register specifically related to issues related to making these plans happen. We will assess the risk, using different criteria whether it is the technical, regulatory and operational, perform a semi-quantitative assessment of the potential risk (probability and potential impact) and identify potential mitigations.

Geographically map I&C customer sites and impact on strategic planning

Costain will geographically map I&C customer sites (by sector and by type) using their GIS team. They will seek to create a central data platform that will enable the flexible visualisation of any or all layers developed from available data.

The sensitivity of a key customer (for instance a power station) may affect a sub-area of WWU's network in terms of its ability to switch to hydrogen or hydrogen blends. Depending on the network location of such a constraint relative to other connections there could be a knock-on effect, where a particular sensitive user could impact other downstream users, whether domestic, commercial or industrial. Based on the Risk Review developed we would now attribute the risks identified to certain types of customer sites.

This work will be supplemented by lessons learned during site visits and case studies developed for three specific customers (described earlier). The Risk Review will present each risk and identify which risks apply for sub-groups of customers.

Understand the impact in terms of conversion timescales and final report

Conversion to hydrogen would be expected to take several years across the region, with the concept of a mandated change not favoured at present. Alongside the practical challenges of network conversion, the availability of resources, both physical (steel, concrete and equipment) and trained personnel will be of key importance.

The risk register approach is now continued. We will produce a conversion timescale risk register to assess typical issues and impacts on conversion to hydrogen of sensitive issues. This could be a parallel document developed, building on earlier work on customer sensitivities and practical challenges, or could be a parallel document. We would discuss whether this is appropriate with WWU. This would include: -

- Description of potential issues
- Impact on conversion time (including estimated time)
- Cost of mitigation (comparative high level estimate using cost bands).

Once the data collection process is completed, we will select sites and users with typical needs to use as case studies which describe the typical challenges which will need to be met in supplying hydrogen without compromising service to customers. The case studies will be comprehensive and cover the following areas:

- Existing use of natural gas and core site processes
- Fuel switching/decarbonisation preferences (including hydrogen/hydrogen blend)
- Fuel switching/decarbonisation timelines
- Impact on network transition of preferred decarbonisation route
- Company size, emissions and employment statistics

Whilst the case studies give a detailed understanding of typical customer needs, the report will also list anonymised circumstances of non-typical needs. A comprehensive final report summarising all of the findings will be shared with WWU.

Objective(s)

To produce a report that will inform network planning for the delivery of hydrogen to domestic customers, whilst considering site sensitivity and any behind the meter investment required by I&C customers to ensure hydrogen readiness.

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

Succes will be demonstrated by providing fundamental evidence for how the gas networks should plan for the delivery of hydrogen (including a hydrogen blend) to domestic customers whilst maintaining sufficient network resilience for Industrial & Commercial (I&C)

users.

Project Partners and External Funding

Project Partners are Costain and the project is fully funded via NIA.

Potential for New Learning

The project will allow networks how to plan for a transition to hydrogen and focusses on the short-medium term rather than the long term or end-state of the future energy system.

Scale of Project

This is a desktop study, which is the appropriate level of scale for this project. The project will inform future work, the scope of which is unknown until this project is complete.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

The project itself is desktop so will take place at Costain offices, however the work will be applicable to all networks.

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

External cost: £92,357 Internal cost: £30,786 Total cost: £123,143

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 outputs of this project will provide a clearer understanding of the implications that a hydrogen conversion will have on I&C customers and highlight any potential mitigations that need to be put in place.

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.

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

The outputs of the work will be replicable across GB.

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

Roll out costs are not applicable for this project.

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 issue of planning for the delivery of hydrogen to domestic customers whilst considering site sensitivity for I&C users is universal 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

Work has been undertaken to date to understand the readiness of Industrial & Commercial (I&C) customers, but little work has been done to understand the strategic impact which this may have on how the gas networks should plan for the delivery of hydrogen (including a hydrogen blend) to domestic customers whilst maintaining sufficient network resilience for I&C users.

Relevant Foreground IPR

All foreground IP will be in the form of the report delivered as part of the project.

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

The methodology undertaken in this project is deemed a beneficial part of the network conversion to 100% hydrogen. This is not yet BAU activity for the GDNs.

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