

## NIA Project Registration and PEA Document

### Date of Submission

Sep 2022

### Project Reference Number

NIA\_NGGT0197

## Project Registration

### Project Title

Hydrogen Production Technologies on the NTS

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NIA\_NGGT0197

### Project Licensee(s)

National Gas Transmission PLC

### Project Start

October 2022

### Project Duration

0 years and 7 months

### Nominated Project Contact(s)

Lynsey Stevenson, Box.GT.Innovation@nationalgrid.com

### Project Budget

£256,000.00

## Summary

Gas Transmission and Metering (GT&M) are committed to reducing emissions from the operation of the National Transmission System (NTS) and eliminating emissions by 2050. The transition to hydrogen provides an opportunity to significantly reduce emissions on NTS sites in processes where methane is used as a fuel gas.

There are a number of innovative hydrogen production technologies in development, which create hydrogen from methane, which could then be utilised as a fuel gas on site. The project will aim to investigate potential hydrogen production, from methane, technologies and develop a use case on the NTS.

## Preceding Projects

NIA\_NGGT0182 - Multifunctional graphene coatings for pipeline protection

## Third Party Collaborators

GUIDEHOUSE EUROPE LIMITED

## Nominated Contact Email Address(es)

Box.GT.Innovation@nationalgrid.com

## Problem Being Solved

Gas Transmission and Metering (GT&M) are committed to reducing emissions from the operation of the National Transmission System (NTS) and eliminating emissions by 2050. There are a number of above ground assets which utilise methane as a fuel gas for

operation, producing carbon emissions. The research being undertaken for the transition to hydrogen provides an opportunity to decarbonise some of these processes on the NTS, whilst still transporting methane. Some work has been undertaken previously on the potential for hydrogen to be utilised as a fuel gas for NTS assets. The development of hydrogen production technologies could enable demonstration and implementation of hydrogen as a fuel gas and provide the opportunity to reduce emissions before the transition.

There are a number of innovative hydrogen production technologies in development, which create hydrogen from methane and the project will investigate potential technologies, use cases and locations for the technology.

## Method(s)

Comprehensive market engagement will be undertaken to identify and evaluate potential hydrogen production technologies to be developed for use on the NTS:

- an initial low TRL market scan long-list
- technology categorisation
- creation of a short-list of providers to engage with more directly
- Engagement with suppliers
- Assessment of each technology considering technical and economic requirements

A feasibility assessment of hydrogen production technology on the NTS will be undertaken including the development of requirements, development of potential use cases and identification of potential future demonstration sites. Workshops will be held with the supplier and the GT&M project team to develop the project requirements, potential use cases and suitable locations for a future demonstration.

The project will also investigate the potential regulatory and legislative challenges to concept integration to ensure the concept developed is deployable.

## Measurement Quality Statement

The measurement approach used to meet Data Quality objectives will be through the identification of high calibre project partners who are experts in their given field. In this instance the project will be limited to a desktop study and analysis from TRL4 to TRL6 to inform new insights into the use of hydrogen production technology on the NTS and the use of hydrogen as a fuel gas.

## Data Quality Statement

The project will ensure that data used is of sufficient quality to deliver project objectives by engaging with GT&M colleagues from various areas of the business and choosing operational sites to be assessed where sufficient data is available to ensure a robust assessment can be undertaken. The relevant data and background information will be stored for future access within the National Grid Innovation SharePoint site.

## Scope

The project will be split into 4 work packages:

Work Package 1 - Market Engagement (Duration -

Lead – Guidehouse

Work Package 1 will include:

- Development of a list of mature and low TRL level technologies for hydrogen production
- Technical assessment of each technology
- Economic assessment of each technology
- Market state assessment and identification of leading providers
- Assessment of technologies within a jointly agreed weighting framework to identify best performers.

Work Package 2 - Innovative Engineering Ideation (Duration –

Lead – Guidehouse & GT&M

Work Package 2 will include:

- Development of a comprehensive list of hydrogen production use cases
- Assessment of potential use cases
- GT&M validation

Work Package 3 – Use Case Development for Pre-FEED

Lead – Guidehouse

Work Package 3 will include:

- Engineering assessment of requirements for connection of chosen hydrogen production use case to sites
- Development of site assessment criteria and evaluation of sites
- Consideration of requirements for emissions abatement and decarbonisation of use case on site.
- Development of cost estimate to complete demonstrator and estimate for use case rollout

Work Package 4 – Concept Deployment Readiness

Lead – Guidehouse

Work Package 4 will include:

- Design typical technology use case
- Assessment of regulatory and legislative landscape
- Reporting of all 4 work packages
- Project closure, summary report and ENA project closure report

## **Objective(s)**

The objectives of the project are to:

- Research and assessment of innovative hydrogen production technologies

- Development of use case for hydrogen production technology on the NTS
- Determine the feasibility of implementing hydrogen production technology on the NTS to reduce carbon emissions

Develop a use case concept ready for demonstration

### **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. This is because it is a transmission project.

### **Success Criteria**

The following key criteria need to be met for the project to be considered successful:

- Objectives met to time and cost.
- Project findings inform potential for hydrogen production technologies to be implemented on the NTS

### **Project Partners and External Funding**

Gas network – National Grid Gas PLC

Technical & Industrial Lead – Guidehouse, with support from Premtech

### **Potential for New Learning**

The project will provide insight to the hydrogen production technologies on the market and their suitability for use on the NTS. A potential use case will be developed which will have the opportunity to decarbonise assets on site which currently use methane as a fuel gas. The findings from the project will be uploaded to the ENA Smarter Networks portal and will be shared via GT&M innovation social media.

### **Scale of Project**

The project is a desktop-based study which will provide insight into whether there is an opportunity to utilise hydrogen production technologies on the NTS, and provide a use case for the hydrogen produced. This learning could enable the use of hydrogen as a fuel gas for assets which currently use methane, reducing carbon emissions.

### **Technology Readiness at Start**

TRL3 Proof of Concept

### **Technology Readiness at End**

TRL5 Pilot Scale

### **Geographical Area**

United Kingdom – Warwick, London and Ashby

### **Revenue Allowed for the RIIO Settlement**

None - Hydrogen network focused project

### **Indicative Total NIA Project Expenditure**

£256000

## 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 project could provide a suitable use case for hydrogen production technology which could support the decarbonisation of assets which utilise methane as a fuel gas, reducing carbon emissions before the injection of hydrogen into the NTS.

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

Although this project does not directly affect vulnerable consumers the energy transition may and as such, we must consider the effect of the work we are doing through the NIA funding. The National Transmission System (NTS) is a key UK infrastructure for the transport of Gas to consumers, including those considered vulnerable. In a scenario where hydrogen replaces methane as a household heat source, it is essential the vulnerable are not excluded by virtue of fuel inaccessibility. In cases where vulnerable consumers already utilise gas it is likely that in a net zero future the optimum option is to provide a consistent energy solution. The transition to hydrogen within the NTS provides continuity of access to the vulnerable of hydrogen as a replacement to methane, with ongoing benefits of efficiency and economy of scale within a closely regulated environment. Ensuring robust NTS assets and consistent hydrogen production options will support the transition of the NTS to hydrogen which in turn supports the availability of gas to the vulnerable.

### 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)

RIIO- 1 question N/A

#### Please provide a calculation of the expected benefits the Solution

As the benefits of this project will be environmental it is difficult to quantify the benefits. The opportunity to fuel assets with hydrogen at NTS sites would reduce carbon emissions before the transition to hydrogen. The project will also inform the hydrogen strategy for the NTS.

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

The project is focussed on hydrogen production technologies on the NTS; however, the research undertaken and learning from the project is applicable to all GDNs within the UK as they look to decarbonise their natural gas networks and will assist with future hydrogen conversion projects.

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

N/A – The Project does not intend to rollout anything, but knowledge and information generated through the lifecycle of the project. Consideration of the business case for utilising the hydrogen production system and use case beyond the project shall form part of the final report.

### 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 research and analysis undertaken in this project will be applicable to all natural gas pipeline operators and will inform the strategy for hydrogen in the energy transition. Findings from the project will determine the feasibility of hydrogen production facilities on the NTS and their potential use cases. The learnings could also be used to inform the potential for hydrogen production technology to be installed on the gas distribution networks in the UK.

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

RIIO-1 Question 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.

There will be no duplication of activities done as part of this program. Although there are many innovative hydrogen production technologies currently in development, none have been assessed for use on the NTS.

### 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

The project will research innovative hydrogen production technologies and subsequently assess their suitability for use on the NTS.

## **Relevant Foreground IPR**

The results of this project will allow us to determine the feasibility of hydrogen production technology on the NTS, and its use on NTS assets. The project will assess a number of hydrogen production technologies to determine the most suitable for use on the NTS, and create a use case. The project would enable a pre-FEED for demonstration of the technology to be conducted following completion of the project, if the technology use case is found to be feasible. As this stage it is not thought any IPR will be generated from the project.

## **Data Access Details**

Data for this project, and all other projects funded under the Network Innovation Allowance (NIA) funding scheme, can be found or requested in a number of ways:

- A request for information (RFI) via the Smarter Networks Portal at <https://smarter.energynetworks.org>. National Grid Gas Transmission regularly publishes much of the data arising from our innovation projects on the ENA portal, before submitting a RFI check this website.
- Via our managed mailbox [box.GT.Innovation@nationalgrid.com](mailto:box.GT.Innovation@nationalgrid.com). Further data can be shared upon request through the innovation mailbox. Each request will be assessed by the GT Innovation Team for its merits and viability.

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

Hydrogen production technology is currently not utilised on the NTS, and the most suitable systems and potential use cases have not yet been assessed. Hydrogen is being directed as a future energy solution but RIIO-2 business funding does not allow the development of hydrogen ready solutions and therefore this project cannot be undertaken as part of BAU activities.

## **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**

This application and technical challenges around hydrogen production technology on the NTS requires early stage research and assessment and therefore carries additional exposure to risk. The NIA funding reduces exposure to risk and enables feasibility assessment of hydrogen production technologies.

## **This project has been approved by a senior member of staff**

Yes