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## NIA Project Registration and PEA Document

### Date of Submission

Jun 2022

### Project Reference Number

NGNG\_NIA\_346

## Project Registration

### Project Title

ATEX Equipment & SR/25 Modification Assessment

### Project Reference Number

NGNG\_NIA\_346

### Project Licensee(s)

Northern Gas Networks

### Project Start

July 2022

### Project Duration

0 years and 10 months

### Nominated Project Contact(s)

Chris Bates cbates@northerngas.co.uk

### Project Budget

£380,000.00

## Summary

Survey and review of existing transmission and distribution infrastructure to assess suitability of electrical connections for use with 100% hydrogen. Current hazardous area classifications and design of electrical connections

### Nominated Contact Email Address(es)

innovation@northerngas.co.uk

## Problem Being Solved

The UK was legally bound to make ambitious carbon reductions under the terms of the Climate Change Act (2008). However, the UK government signed legislation on 27th June 2019 committing the UK to a legally binding target of Net Zero emissions by 2050. This means the UK must tackle decarbonisation at pace and change the way energy is produced, transported and consumed to meet this new target.

All networks have committed to work with stakeholders and the government to work towards a strategy to convert the gas distribution networks to hydrogen, including the NGN H21 100% hydrogen project.

In order to utilise the existing transmission and distribution gas networks to transport hydrogen, the effects of the changes in characteristics of hydrogen from natural gas need to be reviewed and the resultant effect on the network assessed. This is particularly of importance for the upcoming H21 Phase 3 Occupied Trials project and future conversion projects.

To date the impact on conversion on hazardous area classification and electrical connection compliance / suitability has been limited due to the IGEN standard for hazardous area classification being limited to use of assets under natural gas conditions. A review and supplement to this standard has given the opportunity to further the quantification of feasibility for conversion of existing infrastructure to use for 100% hydrogen through assessment of existing configurations, hazardous areas and E&I equipment.

## Method(s)

This will include a full survey of electrical and instrumentation equipment in accordance with relevant standard and identification of any electrical equipment of classification IIB (not inclusive of IIB+H2) and below within current hazardous areas, this is to be benchmarked against existing audit records for each site.

An assessment of hazardous area classifications for existing installations under assumed conversion to 100% hydrogen conditions is to be undertaken to determine impact on current specification equipment.

The proposed range of sites includes:

- 2 x HP Network Offtakes (NGGT Asset inclusive)
- 6 x HP PRIs
- 2 x Above ground exposed pressure reduction
- 2 x Above ground non-exposed pressure reduction within kiosk / building
- 1 x Below ground
- 5 x District Governor
- 2 x GRP Kiosk
- 2 x Brick / stone building
- 1 x Below ground module
- 1 x HP Storage Site

This range of sites covers both transmission and distribution infrastructure across various constructions and configurations.

#### Quality Assurance Plan

The supplier Integrated Management System (IMS) has achieved the following accreditations for Design Engineering and Consultancy within the Energy Sector:

- I.S. EN ISO 9001:2015 (Quality Management Systems)
- I.S. EN ISO 14001:2015 (Environmental Management Systems)
- I.S. EN ISO 45001:2018 (Occupational Health and Safety Management Systems)
- Achilles UVDB & Verify B2

## Scope

### Objective 1: ATEX equipment suitability

Due to the difference in characteristics and group classification between natural gas and hydrogen any conversion of existing equipment will require assessment that assets are suited to use within a hydrogen atmosphere (II C), as this may not currently be the case (II A / B). The BS EN 60079 suite of standards provides guidance on equipment ratings intended for use within hazardous areas and explosive atmospheres. Due to equipment classification it is evident that assets designed for use within a natural gas atmosphere may not be suitable for continued operation post-hydrogen conversion. The extent of this issue has not yet been quantified, this deliverable of the project will undertake an assessment of suitability for current electrical and instrumentation equipment for conversion to hydrogen under current hazardous area classification.

This will include a full survey of electrical and instrumentation equipment in accordance with relevant standard and identification of any electrical equipment of classification IIB (not inclusive of IIB+H2) and below within current hazardous areas, this is to be benchmarked against existing audit records for each site.

### Objective 2: SR25 Modification Impact

The ATEX 153 Directive (1999/92/EC), implemented into UK law as the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR), has placed obligations to classify installations into hazardous and non-hazardous areas. Gas networks have traditionally not classified below 7 bar installations, but this has been required for new installations from 30th June 2003, meaning all natural gas installations are required by law to undergo DSEAR risk assessment. Whilst a hazardous area classification drawing is not a specific requirement of DSEAR, this will often be the most convenient method of presenting the data. IGEN standard IGEN-SR-25ed2 complements BS EN60079-10-1 by providing detailed requirements for the hazardous area classification of permanent and temporary Natural Gas Installations. A hazardous area is an area in which explosive gas/air mixtures are continuously present frequently or for long periods of time, or are likely to occur during normal operation, or are unlikely to occur but do so infrequently for

short durations of time. such as to require special precautions for the construction, installation, operation and maintenance of electrical & instrumentation equipment.

IGEM have undertaken a comprehensive review of IGEM-SR-25ed2 to determine whether the existing standard or guidance provide methodologies suitable for area classification of systems using either HII or HII/NG blends. Conclusion of this assessment illustrated that for a substantial range of scenarios application of IGEM/SR/25 without modification would result in significant underestimation of hazardous zones for release of either HII or HII/NG blends. The methodologies of the approach remain valid, however further evaluation is required through additional generation of HII specific data in order to develop a HII supplement to the standard.

On completion of this supplement the Employer requires an assessment of existing installations with assumed conversion to 100% hydrogen in order to determine impact on current specification equipment.

A full review of SR/25 hazardous area classification will be undertaken for each site using the supplement as published.

A full review of existing SR/25 drawings under current specification will be required to ensure accuracy of existing assessment, and validity of HII review.

#### Financial benefit

Undertaking this project will allow for the progression of feasibility into decarbonisation of gas infrastructure and domestic heating. Decarbonisation of natural gas infrastructure will represent a significant financial benefit against the cost of full electrification for domestic heating.

### Objective(s)

Undertake hazardous area assessment on a range of sample sites to determine variation in HA zoning following conversion to 100% hydrogen.

Undertake surveys on a range of sample sites to determine suitability of existing electrical and instrumentation equipment and connections following conversion to 100% hydrogen

Produce technical guidance on extend of potential works to ensure compliance to DSEAR and ATEX regulations.

### 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

Undertake hazardous area assessment on a range of sample sites to determine likely increase in HA zoning following conversion to 100% hydrogen.

Undertake surveys on a range of sample sites to determine suitability of existing electrical and instrumentation equipment and connections following conversion to 100% hydrogen

Produce technical guidance on extend of potential works to ensure compliance to DSEAR and ATEX regulations.

### Project Partners and External Funding

Cadent £126,587

Southern (Scotia) Gas Networks £63,293

Wales and West Utilities £31,647

Northern Gas Networks £31,647

National Grid Gas Transmission £31,647

Total £284,821

### Potential for New Learning

Output of this project will impact wider learning through the H21 suite of projects and wider hydrogen conversion works in the form of technical assessment to suitability of conversion for existing assets. Learning gained from this project will form technical guidance

towards the suite of hydrogen conversion evidence and the safety case for hydrogen networks. In addition to guidance notes, stakeholder engagement sessions and output dissemination groups will be conducted throughout, and on completion of, the project.

## Scale of Project

The scale of the project has been designed to cover a representative sample of sites across transmission and distribution infrastructure. This encompasses a range of configurations and construction methods for a variety of sites across all pressure tiers. Any reduction of scale in the project would lead to gaps in the assessment and would be required to complete evidence suite for conversion.

## Technology Readiness at Start

TRL3 Proof of Concept

## Technology Readiness at End

TRL5 Pilot Scale

## Geographical Area

Due to the requirement for a range of sites the project will be undertaken across 3 GDN areas, NGN, WWU and Cadent, incorporating assets from each as well as NGGT.

## Revenue Allowed for the RIIO Settlement

N/A

## Indicative Total NIA Project Expenditure

Partner	External	Internal
Cadent	£126,587	£42,196
National Grid Gas Transmission	£31,647	£10,549
Northern Gas Networks	£31,647	£10,549
Southern (Scotia) Gas Networks	£63,293	£21,097
Wales and West Utilities	£31,647	£10,549
Total	£284,821	£94,941
Grand Total	<b>£379,762</b>	

## 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:

This project is necessary to facilitate the transition for a natural gas transmission and distribution system to a network transporting 100% hydrogen. Conversion of existing mechanical infrastructure and associated E&I systems will need to be assessed to ensure compliance with ATEX and DSEAR regulations governing the use of electrical connections within potential explosive atmospheres (hazardous areas). This project will undertake assessment or a sample of existing natural gas installation in order to quantify the suitability for current configurations to be used for 100% hydrogen transmission, or if overhaul and reconfiguration would be a necessity. This assessment is to take place utilising the recently published guidance on hazardous area classification (IGEM/SR/25 H2 and H2 blend supplement) in conjunction with an audit of existing electrical connections and placement within hazardous area zones.

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

Not applicable

### 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)

Not applicable

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

Not applicable

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

This method would be replicable across all natural gas infrastructure sites UK wide.

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

This method would be replicable across all natural gas infrastructure sites UK wide.

### 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 learning undertaken as part of this project is applicable to all GDNs and NGGT within the UK as all apply the same construct and design engineering standards, and so will assist with future Hydrogen conversion projects. This will also allow for advanced consideration of hydrogen conversion for asset investment prior to conversion.

#### 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.

This is a collaborative project including all parties responsible for gas transmission and distribution. The sample of sites marked for assessment has been developed to provide complete representation of assets on transmission and distribution networks in order to prevent the need for further duplication.

#### 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

Assessment of existing gas distribution and transmission AGIs / PRUs under hydrogen transportation conditions has not been undertaken previously. The results of this project will allow a more comprehensive assessment of the feasibility of conversion of existing UK gas infrastructure for the use in transporting hydrogen. The output of this project will be integral in quantifying the feasibility of large scale hydrogen conversion of existing natural gas infrastructure, and will allow new design considerations and targeted investment in the lead up to a net-zero network.

### Relevant Foreground IPR

N/A

## Data Access Details

N/A

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

This project is to further the feasibility and evidence base for conversion to a 100% hydrogen network.

### **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 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 the commercial benefits and technical/operational risks associated with 100% hydrogen projects are outside the traditional environment of any gas distribution network or its shareholders.

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

Yes