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 2019

Project Reference Number

NIA_CAD0043

Project Registration

Project Title

Gas Demand Forecast - Phase 3 - Hydrogen

Project Reference Number

NIA_CAD0043

Project Licensee(s)

Cadent

Project Start

July 2019

Project Duration

0 years and 4 months

Nominated Project Contact(s)

Cadent Innovation Team

Project Budget

£25,603.00

Summary

The project will utilise both desktop based and feedback from each GDN about how they see the take up of hydrogen across their networks.
This will then be developed into an initial high-level picture / 'storyline' for each GDN area as to the penetration / volumes of hydrogen in the network we will see, and the likely timing for this.

Nominated Contact Email Address(es)

Innovation@cadentgas.com

Problem Being Solved

Following the completion of the Gap Analysis study at the end of 2018 (under NIA_WWU_047), carried out by Delta-ee, the work was deliberately limited to Biogases and other technologies and excluded hydrogen.

At the time this was seen as sensible to progress the project whilst further work continued in other projects around the viability and options for hydrogen. Since that time more focus has been placed on hydrogen, not only due to the large investment in innovation around hydrogen. But the recent announcement by the government regarding the move to a net zero target rather than 80% reduction in CO2.

The gap from Gas Demand Forecasting phase 2 regarding hydrogen now needs addressing. This gives each GDN a view of how hydrogen demand will potentially grow within their networks. The required output is required to slot into the previous project outputs.

Method(s)

The project will utilise both desktop based and feedback from each GDN about how they see the take up of hydrogen across their networks.

This will then be developed into an initial high-level picture / 'storyline' for each GDN area as to the penetration / volumes of hydrogen in the network we will see, and the likely timing for this.
a. This 'storyline' will be discussed with and agreed with each GDN on an iterative basis, before carrying out the carbon savings

analysis.
b. The storyline at a REGIONAL level will be built up, considering:
i. The current levels of research activities / projects around hydrogen taking place at the regional level – likely to drive small differences in the timing of when we start to see hydrogen being injected into the distribution networks in significant volumes.
ii. The location of potential 'hydrogen towns' or 'hydrogen cities' – i.e. identify the towns / cities that are testing or seriously considering hydrogen conversion in the future. If a number of these towns / cities fall in the same GDN network, this could accelerate uptake of hydrogen compared to other networks.
iii. Where hydrogen is likely to be produced in the UK, in the short term. In the longer term, we can assume that hydrogen availability will be similar across the UK, but the next 5, 10, 15 years, it will likely appear in pockets in certain regions. This will drive differences in the volumes of hydrogen and timing of this in the different GDN networks.
iv. The mix of industrial sectors in each GDN region. Some industrial sectors are more suitable for hydrogen than others – if we see higher concentrations of these industries in a GDN area compared to others, this could influence the speed of uptake of hydrogen in that network. We will utilize the data on the industrial sectors in the GDN Gap Analysis study to support this.
This will be distilled into a simple % evolution of the share of the gas network that could be hydrogen for each GDN network (with a clear and simple storyline built around the 4 points above).

The output from above will then feed into an excel-based modelling to derive the carbon savings the hydrogen could deliver at different times in the future.

a. utilising the % hydrogen penetrations identified above in the different regions.
b. use the annual gas demand forecasts for each sector (from the recently carried out GDN project). The key elements of this study used are:
i. Residential gas demand forecasts to 2050 (see figure 2 below)
ii. Commercial sector gas demand forecast to 2050
iii. Industrial sector gas demand forecast to 2050 (see figure 3 below)
The output of this will be 'total carbon savings at the regional' that could be realised at different years in the future (e.g. 2030, 2040, 2050) as hydrogen penetration grows.
Resulting in a report which can be added to the previous project outputs.

Scope

The project shall consider all the UK and how the hydrogen demand may vary across it. The potential deployment of hydrogen at blend and full conversion levels.
The project will focus on hydrogen for heat and Industry in detail with high level commentary regarding transport and power generation demand.

Objective(s)

This scenario should be built up considering:
• Regional differences between the GDNs: the mix of industries at the regional level, the level of current hydrogen activities / trials, and the amount (and type) of renewable generation capacity will influence the deployment of hydrogen differently in each GDN region.
• Timing of uptake of hydrogen: the timing of deployment of hydrogen needs to be realistic – considering the infrastructure changes required, appliance upgrades needed, current activities already taking place in the different regions, the mix of industries across the regions (and timing of switching of these industries to hydrogen).
• Blending versus 100% conversion

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The outputs for the project can be summarised as follows:
• A short ~15-page document, that can be incorporated into the existing GDN Gas Demand Gap Analysis study, containing:
• A high-level indication of the volume (and sources) of hydrogen that could be available in the UK to 2050.
• A simple storyline for how the volume / penetration of hydrogen in the gas network will evolve to 2050 – at the regional level. There should be a short and clear narrative for each of the 4 GDN networks.
• A summary of the carbon savings contributions that could be realised from hydrogen deployment in the UK to 2050 – in 2030, 2040 and 2050.
• High level commentary (likely 1 – 2 slides max) on the implications of hydrogen deployment in other sectors (e.g. power generation sector, transport sector) and on the need / urgency for electrification (i.e. what level of electrification / HP deployment is required to satisfy carbon reduction targets if the gas grid decarbonises?)
• A separate excel file with the key assumptions and data behind charts

Project Partners and External Funding

The work is collaborative across the networks and will be undertaken by DeltaEE. WWU will be a non-funding party ensuring a full UK picture.

Potential for New Learning

The learning from the project on hydrogen demand completes the picture of the original gas demand forecasting phase 2 project. This

view of hydrogen demand is informing the networks future need and investment requirements.

Scale of Project

The project will be a desktop study.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

This project will be across all the UK.

Revenue Allowed for the RIIO Settlement

Not applicable

Indicative Total NIA Project Expenditure

£25,603 - SGN,Northern Gas Networks and Cadent fund 1/3 each

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:

n/a

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)

This research project will provide long term savings to GB customers by providing better long-term planning decisions. Optimising capacity management and network design through use of improved forecasts has the potential to reduce the risk of unnecessary investment.

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

This is a research project.

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

This is a research 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

This modelling together with other gas futures research will provide the networks with a holistic view and impact assessment allowing them to better predict future hydrogen requirements for their Gas Networks. This work will support the UK's strategic aim to allow use of smart technologies to help decarbonise energy over the next 40 years.

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

The project addresses how the decarbonisation of the UK impacts on the gas networks and associated demand.
☑ Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

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 are a number of projects looking at the future demand requirements, this project is including all GDN's with the greatest knowledge of expected potential on their networks. Outcomes from this project will be shared with other interested parties.

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 innovative aspect of this project is that we are looking to build from the previous innovation in Gas demand forecasting phase 2. The forecasting of the heat and industrial demand for hydrogen has only just begun to be carried out. Building from the learning from the previous project is key.

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

There is uncertainty about the long-term volume and characteristics of different load type and how this will affect the mode, this uncertainty is a risk to the GDN's.

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 detailed plan that will be produced as part of the project should ensure that the model is improved for future network investments, however we cannot be certain of this until the analysis has been completed, which is a risk to all networks.

This project has been approved by a senior member of staff

☑ Yes