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

Sep 2018

Project Reference Number

NIA_SGN0131

Project Registration

Project Title

Domestic Carbon Capture

Project Reference Number

NIA_SGN0131

Project Licensee(s)

SGN

Project Start

October 2018

Project Duration

1 year and 1 month

Nominated Project Contact(s)

Phil Bradwell, Innovation Project Manager

Project Budget

£98,500.00

Summary

The main aim of this project is to assess the technical and logistic feasibility of domestic scale carbon capture options and to understand the implications on overall performance and safety.

This project will aim to build upon existing knowledge of carbon capture focusing on domestic customers.

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

Nearly two-thirds of UK energy consumption is by domestic customers (heating and cooking) and transport. These sectors need to develop ideas and systems to reduce the amount of CO2 emitted. The scale of the decarbonisation of energy problem is very large, and meeting the target of 80% reduction in carbon emissions by 2050 is a big challenge. As the economy decarbonises, we must ensure that households and businesses are served by networks that are flexible enough to support the available range of energy sources.
80% of UK homes are heated using a gas central heating boiler. This results in around 54 million tonnes of CO2 emitted each year. This is a sizable proportion of the emissions from natural gas usage, and there is a potential to capture these emissions to reduce the overall CO2 emissions.
On an individual household basis, the average gas consumption for domestic properties is around 12,000 kWh per annum. Based on a carbon emission factor of approximately 0.184 kg CO2 per kWh, a typical domestic property produces 2.3 tonnes of CO2 per annum from combustion of natural gas in boilers, cookers and fires.
There is potential to reduce the carbon emissions by capturing the carbon at the source on a domestic level. This can provide a number of challenges as the carbon emitted by domestic customers is distributed over 22 million homes, and is not necessarily at one emission point in each property as many homes have a gas boiler, gas cooker and gas fire.

Method(s)

This project aims to identify and develop concepts for carbon capture in the domestic gas market. The project aims to address:

- Assessment of carbon capture technologies.
- Quantify the potential carbon emission reduction based on the current performance of the materials.
- Evaluate the impact on the performance and operation of appliances.

Scope

The main aim of this project is to assess the technical and logistic feasibility of domestic scale carbon capture options and to understand the implications on overall performance and safety.

This project will aim to build upon existing knowledge of carbon capture focusing on domestic customers.

Objective(s)

The objectives of this project are to:

- Carry out an assessment of carbon capture technologies for domestic gas boiler flues, evaluating the performance of existing materials, and the requirements for releasing the captured carbon dioxide in a controlled and useful manner during processing operations.
- Quantify the potential carbon emission reduction based on the current performance of the materials, and a prediction of the future targets for such technologies.
- Evaluate the impact on the performance and operation of appliances to assess if a retro-fit is possible or if full appliance replacement is required.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The following success criteria for the project include the completion of:

- Technology assessment on the material options for carbon capture from domestic flue gases.
- Evaluation of the engineering requirements for the carbon capture concept units.
- Technology assessment focusing on processing the carbon capture for collection, transport and release.
- Review of methanation process and the resulting renewable methane gas quality.
- A study to review the capex and opex options for possible carbon capture options.
- Review of the introduction of renewable methane from distributed entry points on the gas networks.
- A final DNV GL report, consolidating the information in the Technical Notes.
- A presentation of findings to the SGN team.

Project Partners and External Funding

DNV GL

Potential for New Learning

The project is expected to deliver the following new learning for Network Licensees:

- Better understanding of carbon capture at domestic usage level.
- Assessment of carbon capture technologies.
- Quantify the potential carbon emission.

Scale of Project

This project involves a conceptual study of domestic scale carbon capture. The outcome from this project will be a “proof of concept” for domestic carbon capture and possible pathways to extend this through further research and development.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

This project will be focused on SGN’s network, but the outputs and methods can be shared with all the GDNs.

Revenue Allowed for the RIIO Settlement

This is a low TRL research project, therefore not applicable.

Indicative Total NIA Project Expenditure

The total project expenditure is £98,500, 90% (£88,650) of which will be recovered via the NIA funding mechanism in line with the funding conditions.

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 project is at a low TRL and it is therefore not possible to provide an accurate estimate of the potential saving to customers at this stage.

The overall concept of carbon capture for domestic customers is estimated to have a substantial saving both financial and environmental.

Please provide a calculation of the expected benefits the Solution

N/A

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

The potential outcomes of this project are applicable to all networks, where Network Licensees are aiming to reduce carbon emissions.

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

N/A

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 learning gained from this project aims to inform Network Licensees of the potential carbon capture benefits relating to domestic customers.

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

☑ 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.

A review has been made of all other Network Licensees and no other similar projects have been carried out.

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

Carbon capture at point of use on domestic level is a new area of research being investigated. With increased focus on reducing carbon emission, research on innovative technology to help reduce carbon emissions is being carried out.

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 aims to address long term issues of reducing carbon emissions. This project is also looking at innovative technology and applying it to domestic customers.

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 NIA project has a low TRL and involves carrying out a conceptual study. This project is applicable to all the GDN's where the learning can be shared between the networks.

This project has been approved by a senior member of staff

☑ Yes