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

Mar 2019

### Project Reference Number

NIA_SGN0138

## Project Registration

### Project Title

East Neuk – A Techno Economic Study into the Energy System

### Project Reference Number

NIA_SGN0138

### Project Licensee(s)

SGN

### Project Start

February 2019

### Project Duration

0 years and 7 months

### Nominated Project Contact(s)

Colin Thomson

### Project Budget

£205,000.00

### Summary

This project will assess how an integrated hydrogen energy system in Fife will work and how to it could function at a much larger scale for Scotland. Electricity from a variety of renewable sources are couples via the electricity network and an electrolyser to the gas network in the form of hydrogen. This in turn can be utilized directly in a vehicle refuelling station or at different offtake points from the gas network to supply domestic and commercial properties.

The electrical network in this part of Fife is constrained and any increase to the amount of installed renewable generation capacity without upgrading the network would likely result in increased curtailment of output. Maximising utilisation of assets, revenue opportunities from multiple energy streams, and potentially other local economic benefits points to the consideration of combining gas, electricity and transport infrastructure in an optimal way.

### Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

### Problem Being Solved

As greater amounts of embedded generation connect into the distribution network there becomes a necessity for either large network upgrades or more flexible smarter use of the network. Presently there is significant curtailment of renewable power both within SPEN and across other licensees due to constraints that occur within the network. In addition to curtailment many renewable energy projects are unable to obtain connection without extensive network upgrades.

Further, the decarbonisation of heat means that hydrogen is an attractive alternative to natural gas and will become a greater player in the future energy mix. Hydrogen generated through electrolysis will result in additional electrical demand to supply the electrolysis process therefore an opportunity for its use in a cross-vector flexibility market exists. However, there is little previous work or knowledge on the topic and hence this project aims to address this.

The flexibility issue is being addressed through many other projects across all licensees. However, the ability to use other vectors such as Hydrogen is not being explored within these. Therefore, this is the precise issue that a solution is being sought for in this project.

## Method(s)

The project will assess how an integrated hydrogen energy system in Fife will work and how to it could function at a much larger scale for Scotland. Electricity from a variety of renewable sources are couples via the electricity network and an electrolyser to the gas network in the form of hydrogen. This in turn can be utilized directly in a vehicle refueling station or at different offtake points from the gas network to supply domestic and commercial properties.

The electrical network in this part of Fife is constrained and any increase to the amount of installed renewable generation capacity without upgrading the network would likely result in increased curtailment of output. Maximising utilisation of assets, revenue opportunities from multiple energy streams, and potentially other local economic benefits points to the consideration of combining gas, electricity and transport infrastructure in an optimal way.

## Scope

The project will comprise a review of the energy system optimisation to explore how the gas and electricity networks, both present and future, could maximise local energy generation, distribution and efficiency in the East Neuk of Fife region.

The scope will be carried out through the following tasks:

- A literature review to identify previous work in the area.
- A detailed investigation into the level of constraints and generation curtailment on the network in the East Fife area. This shall include quantification of the energy that could potentially be released for Hydrogen generation.
- Assessment of how the constrained energy could be used to generate and use or store Hydrogen at the demonstration site in Levenmouth. This will identify how the constrained energy can be converted into Hydrogen either for blending or 100% delivery. The assessment will consider use in domestic and commercial properties including EV opportunities. It will identify how to maximise electric, Hydrogen or low emission vehicles in region.
- A review of how access to gas networks is best facilitated for renewable generators and how can SGN and other gas networks support the DSO role in future.
- An assessment of commercial arrangements for the use of constrained energy for the production of hydrogen with a particular focus on how site at Levenmouth may support work in the FUSION project.
- Reports on results and dissemination of findings.

## Objective(s)

The primary objectives of the project are to quantify constrained energy in the East Neuk of Fife and demonstrate how its conversion to Hydrogen can be maximised for either the gas network or for EV purposes. This will highlight opportunities and the extent that Hydrogen may be able to participate in the decarbonisation of the region.

## Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

## Success Criteria

Success criteria for the project will be:

- Demonstrating that it has increased knowledge in the area of hydrogen storage from constrained electrical energy.
- Highlight opportunities in the east Fife area to support the FUSION project and potential roll out.
- Demonstration of integrated cross vector project delivery.

## Project Partners and External Funding

This project is a collaboration with SGN, SP Energy Networks and E4Tech as the Partners.

## Potential for New Learning

The project provides new learning in the use of Hydrogen as a medium for utilising excess electrical energy which is presently constrained in the East Neuk of Fife area. Particularly, the project will provide learning into the effect of how an overlay of the electrical and gas networks can be used to optimise the reduction of constraints on the electrical network through the use of Hydrogen. This will bring both technical learning and ‘company process’ learning through collaboration in cross vector projects between gas and electrical networks.

## Scale of Project

The project will be a feasibility study covering the East Neuk of Fife area. If successful, then roll out of a trial project may be possible in the future.

## Technology Readiness at Start

TRL2 Invention and Research

## Technology Readiness at End

TRL3 Proof of Concept

## Geographical Area

The project will focus on the East Neuk of Fife area.

## Revenue Allowed for the RIIO Settlement

None

## Indicative Total NIA Project Expenditure

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

# 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)

Savings will be made through the increased use of embedded generation without need to upgrade network assets. Overall the flexibility market could be worth up to £8bn (National Infrastructure Commission, Smart Power 2016) and through this project the potential benefits across the UK for use of Hydrogen as part of this will be identified.

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

Not required as it is a research project.

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

This project is highly replicable as it is an issue that will be applicable to all network licensees.

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

This will not lead to a roll out as it 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

The project will provide useful learning into the use of Hydrogen as a cross vector medium which will support the change towards flexible markets and DSO models. This knowledge will be applicable to all electrical and gas network licensees.

### 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 of the ENA smarter networks portal has revealed no duplicate projects.

### 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 comprise a review of the energy system optimisation to explore how the gas and electricity networks, both present and future, could maximise local energy generation, distribution and efficiency in the East Neuk of Fife region. The project will quantify constrained energy in the East Neuk of Fife and demonstrate how its conversion to Hydrogen can be maximised for either the gas network or for EV purposes. This will highlight opportunities and the extent that Hydrogen may be able to participate in the decarbonisation of the region.

### 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

The development of a whole system approach is a new concept to both gas and electricity networks, the NIA framework offers a

robust, open framework to support this work and ensure the results are fully articulated to all stakeholders.

## 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