

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

Dec 2021

### Project Reference Number

NIA2\_SGN0010

## Project Registration

### Project Title

HyScale Academic Review

### Project Reference Number

NIA2\_SGN0010

### Project Licensee(s)

SGN

### Project Start

December 2021

### Project Duration

0 years and 3 months

### Nominated Project Contact(s)

Phil Bradwell

### Project Budget

£13,125.00

## Summary

The project will engage Imperial College London to conduct a rigorous and impartial academic review of the HyScale LOHC Feasibility Study (NIA\_SGN0164) completed in March 2021. The HyScale project is investigating a range of hydrogen carrier technologies, and their role within a sustainable hydrogen economy

### Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

## Problem Being Solved

The UK government has committed to reducing greenhouse gas emissions to net zero by 2050. The government's plans identify the need for low or no carbon heat as being essential for meeting this target. A major focus of GDN's and NGGT is the use of hydrogen injected into the gas grid (blended or 100%) to achieve this. This will result in a large requirement of hydrogen to be produced and stored using brand new infrastructure.

Natural gas seasonal storage requirements are currently facilitated via the NTS system which is connected to a number of large storage facilities throughout the UK. At present, various solutions are being considered as to how future storage system could operate on a 100% pure hydrogen basis. Any wide scale conversion of the NTS and associated storage systems from Natural gas use to Hydrogen would also introduce many complexities. As with natural gas, any 100% hydrogen networks will need to make provisions for storage, over and above line pack storage in order to meet a networks seasonal demand variation.

100% Hydrogen network solutions are currently being developed on a district/regional basis and/or at gas terminal locations. For

these reasons, localised hydrogen storage options will be required to support current strategies that involve the localised development of 100% hydrogen networks and expansion into the transport sector.

This NIA project must be undertaken as a key decision is required whether to proceed to phase 2 and what modifications need to be built into future phases of HyScale.

## Method(s)

The academic consultant team will review the HySCALE LOHC Feasibility report (NIA\_SGN0164), focusing on:

- Inter-seasonal storage of hydrogen
  - the argument for and techno/economics of inter-seasonal storage for UK gas networks.
  - the recommendation for UK Gas Networks to follow a multi-pronged approach
  - the barriers and technology developments influencing the potential viability of LOHC scale for inter-Seasonal storage
  - The appropriateness of the scale of the proposed 20kg/day demonstration system, covering: cost, feasibility and timeframe
- General feasibility study review
  - Technical: review carriers and examine techno economics of all use cases.
  - Commercial: Review the market opportunities of industrial and SIU applications of LOHC, and review the business model and value chain
  - Legal: review IP considerations

## Scope

Imperial College London will provide a rigorous and impartial academic advisory service to the Hyscale project.

Imperial College London will meet with the project consortium during the course of the review in order to ask questions of clarification and to understand the content of the Phase 1 Feasibility Study in more detail and the intended use of this feasibility study in the stage gating of the proposed demonstration project under Phase 2. The results of the review will then be communicated through:

- A summary of key comments and review issues.
- Detailed comments applied directly to the Phase 1 feasibility report: and
- A teleconference to discuss comments.

## Objective(s)

The objective of this project is to provide a rigorous and impartial academic review of the HyScale LOHC Feasibility Study (NIA\_SGN0164) completed in March 2021.

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

Not applicable

## Success Criteria

The success criteria of this project is a review of the HyScale LOHC Feasibility Study (NIA\_SGN0164) completed in March 2021, communicated through:

- A summary of key comments and review issues.
- Detailed comments applied directly to the Phase 1 feasibility report: and
- A teleconference to discuss comments.

## Project Partners and External Funding

Imperial College London academic team

## Potential for New Learning

The project will provide a critical review of the HyScale feasibility study and the use of LOHCs for hydrogen storage. This will help inform a decision on whether to proceed to further phases and will identify any modifications that will need to be built into future phases of the project.

## Scale of Project

The project will be a desktop study, with regular engagement with the HyScale project team. The independent review will provide

valuable insights on the HyScale feasibility study and will identify any modifications that will need to be built into future phases of the project.

### **Technology Readiness at Start**

TRL2 Invention and Research

### **Technology Readiness at End**

TRL3 Proof of Concept

### **Geographical Area**

This project will consider the entire GB for the LOHC based supply infrastructure.

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

Not applicable

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

£13,125

## 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:

Existing hydrogen projects are already starting to highlight challenges around storage and the transport of hydrogen and how these aspects are key components to a net zero solution.

Practicalities of converting a network from natural gas to hydrogen can also present problems where operations have limited flexibility regarding storage.

Gas networks have historically considered how to resolve the off-grid problems with more recent CNG solutions being implemented, reducing consumer costs and provide cleaner air solutions however, networks are now increasingly being tasked by industry for lower carbon solutions that could value support from LOHC usage.

The project will engage Imperial College London to conduct a rigorous and impartial academic review of the HyScale LOHC Feasibility Study (NIA\_SGN0164) completed in March 2021. The HyScale project is investigating a range of hydrogen carrier technologies, and their role within a sustainable hydrogen economy.

#### 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

The potential benefits of the HyScale project are applicable across GDN's and NGGT. All the Network Licensees are aiming to reduce carbon emissions using hydrogen and develop solutions for hydrogen storage.

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

Not applicable

### 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

RIO-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 practicalities of converting a network from natural gas to hydrogen can also present problems where operations have limited flexibility regarding storage.

The HyScale LOHC Feasibility Study (NIA\_SGN0164) was completed in March 2021. The project investigated a range of hydrogen carrier technologies, and their role within a sustainable hydrogen economy. This project will engage Imperial College London to conduct a rigorous and impartial academic review of the HyScale LOHC Feasibility Study. This will help inform a decision on whether to proceed to further phases and will identify any modifications that will need to be built into future phases of the project.

The potential benefits of the HyScale project are applicable across GDN's and NGGT. All the Network Licensees are aiming to reduce carbon emissions using hydrogen and develop solutions for hydrogen storage.

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

Not applicable

### 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.

The scope has been reviewed against all existing projects and no areas of duplications have been identified.

### If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

Not applicable

## **Additional Governance And Document Upload**

### **Please identify why the project is innovative and has not been tried before**

Hydrogen use for heating and injection is a new area of research being looked at within the GB industry. LOHCs are an emerging commercial technology that have not been applied in the above context. With increased focus on reducing carbon emission, research on innovative techniques to help reduce carbon emissions is being carried out.

### **Relevant Foreground IPR**

Not applicable

### **Data Access Details**

Any consumer data gathered throughout this project will be anonymised and will be compliant with General Data Protection Regulations (GDPR) and the UK Data Protection Act. Any compliant data can be made available for review upon request.

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

The project is carrying out research and development on an emerging technology. The objective of this is to develop energy storage solutions and reduce CO2 emissions through the use of hydrogen. This technology is at a low technology readiness level and as such it is not part of the usual activities of the business.

### **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 NIA framework offers a robust, open framework to support this work and ensures the results are disseminated to all licenses. The development of new hydrogen storage technologies potentially involves technical risks. The project will address all considerations and requirements to allow for the safe storage of hydrogen and delivery to end users, converting from existing natural gas supply.

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

Yes