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 2015

Project Reference Number

NIA_SGN0080

Project Registration

Project Title

Gas Polymerisation – Stage 2 - Engineering Development

Project Reference Number

NIA_SGN0080

Project Licensee(s)

SGN

Project Start

September 2015

Project Duration

1 year and 8 months

Nominated Project Contact(s)

Stephen Tomlinson, Innovation Project Manager

Project Budget

£328,667.00

Summary

The scope of work has been split into individual work packages which will be shared between in-house testing and technical partner research.

- Review Chemistry Choice and IP Situation: review chemistries to date, explore additional chemistries and ensure the IP provides freedom to use these chemistries.
- Further Exploratory / Optimisation Chemistry Work: deepen understanding of the selected chemistries and identify requirements for practical testing of these chemistries. This will include how best to deploy the chemistries and maximise the likelihood of a seal.
- Environmental Compatibility Considerations: ensure compatibility with the pipeline environment.
- Review and Assess the Practicalities of Field Deployment: ensure the chemistries can be scaled up and safely deployed in the field.
- Design and Build Flexible Testing System: for use during in-house testing.
- Experimental Testing and Analysis: to assess the performance of the selected chemistries.
- Project Management and Reporting

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

There are a number of contributory factors to SGN's direct carbon footprint; however, approximately 95% is from Natural Gas Leakage. The majority of leakage is from lead yarn and mechanical joints within low pressure distribution networks. One of the highest operating cost areas for SGN is in response to Public Reported Escapes (PRE's), it is estimated, based on data from 1998-2008 that joint repairs accounts for around 85% of all repairs.

This project aims to build on the work carried out under the project entitled “Gas Polymerisation – Proof of Concept” (NIA_SGN0058). This project aimed to develop a highly innovative technology, namely gas polymerisation which uses gas borne sealants which are transported in the gas phase and remotely repair leaks by exploiting chemistry that reacts with unique environmental factors found at leak points.

Method(s)

The project aims to take the lessons learnt and understandings achieved during Stage 1 and carry out an engineering development exercise to address general operational and specific technical questions which have arisen.

The aim of stage 2 (Engineering development) is: to answer the fundamental questions that will then give confidence that the technologies developed can be applied in an operational setting.

Therefore, the key questions that Stage 2 will need to address include:

1. What role does the surrounding soil play in the type of seal that is achieved, and how can that be controlled?
2. How quickly can a seal be created; how porous or otherwise is that seal; how big a leak can be sealed successfully; how does geometry of the leak affect the success of the seal?
3. How can the chosen chemistries be manipulated so that the sealing material properties are optimised?
4. How do the other chemistries and products (i.e. containments with the gas system) interact the chosen chemistries?
5. What are the enabling technologies, techniques or products that will be required for the application of this technology?
6. From an operational viewpoint, what initial considerations are made regarding how the application of the sealant may interact with home appliances such as boilers?

These questions are to be answered using a combination of in-house experimental work and chemical development carried out by a technical partner.

Scope

The scope of work has been split into individual work packages which will be shared between in-house testing and technical partner research.

- Review Chemistry Choice and IP Situation: review chemistries to date, explore additional chemistries and ensure the IP provides freedom to use these chemistries.
- Further Exploratory / Optimisation Chemistry Work: deepen understanding of the selected chemistries and identify requirements for practical testing of these chemistries. This will include how best to deploy the chemistries and maximise the likelihood of a seal.
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Objective(s)

The overall objective of this project (Stage 2) is to take the experimental proof of concept determined in Stage 1 and to carry out the engineering development required to assess real world practicalities for use in an operational setting.

This will lead to recommendations for further project stages involving large scale testing prior to field trials.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

- Review of chemistry options to progress to full feasibility testing.
- Review of chemistry optimisation options for specific use in gas distribution systems.
- Environmental compatibility considerations.
- Field deployment practicality and feasibility study.
- Design of flexible testing system.
- Completed experimental testing and analysis with recommendation for next stage of development.
- Completed full project report.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

This is a small scale initial development project that will be carried out off network. Due to the low TRL it is not possible to accurately comment on the potential future scale until the completion of the project.

However, should the project provide positive outcomes, any future methods/products arising from the successful completion of this phase and all required future phases will be applicable throughout GB.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

This project will be undertaken by Steer Energy and their technology partners at their respective sites.

Revenue Allowed for the RIIO Settlement

During RIIO-GD1 it is estimated that SGN will spend approximately £255.7m and £209.6m on emergency and planned repairs respectively on all mains. As this project is a feasibility study for a technology at a low TRL, it is not yet possible to determine whether revenue savings are likely during RIIO-GD1.

Indicative Total NIA Project Expenditure

The total project expenditure is £328,667, 90% of which is allowable NIA expenditure (£295,800).

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.

However, it is estimated that SGN will spend approximately £255.7m and £209.6m on emergency and planned repairs respectively on all mains throughout RIIO-GD1. Assuming a 4:2:1:1 split in respect to the size of the GB GDN's, this equates to an expenditure for these activities across GB of approximately £232m per annum. Depending on findings and outcomes of this project and its potential follow on projects, this expenduiture could potentially be significantly reduced.

Please provide a calculation of the expected benefits the Solution

N/A – low TRL

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

This project is designed to reduce the leakage of gas distribution networks through the use of gas sealants that are transported with the gas and remotely repair leaks by exploiting chemistry that reacts with unique environmental factors found at the leak site. The focus area will primarily be metallic mains. SGN have approximately 20,000km of metallic mains across all range diameters. As a result, based on a 4:2:1:1 split the total length of mains across GB that this method could ultimately apply to in future years is approximately 80,000km. Similarly, there are approximately 700,000 Network Risers that could also potentially benefit from any outcomes of this project and its future follow on projects.

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

There are no costs associated with sharing the conclusion and recommendations of this study with the other Network Licensees, which will be the first step towards roll out across GB. As stated above, the early TRL means that it is not possible to estimate the costs of deployment at this stage.

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

All Network Licensees will be able to use the learning from this project as the outcomes will be presented in a clearly defined report that will be available to them on request.

The successful completion of this project will provide all GB Network Licensees with an understanding of the potential of using gas polymerisation technology to seal gas leaks in distribution mains and network risers and to remediate pipeline walls.

Although the TRL is too low at this stage to provide an accurate cost benefit analysis, future stages, if carried out, will determine potential benefits, this will then allow the Network Licensees to make informed choices as to whether to invest in this technology following the completion of this stage and the project's subsequent stages.

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.

n/a

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

n/a

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

n/a

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

n/a

This project has been approved by a senior member of staff

☑ Yes