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NIA Project Registration and PEA Document

Date of Submission

Mar 2019

Project Reference Number

NIA_SGN0146

Project Registration

Project Title

High Volume Gas Escapes Toolbox - Stage 2

Project Reference Number

NIA_SGN0146

Project Licensee(s)

SGN

Project Start

March 2019

Project Duration

1 year and 2 months

Nominated Project Contact(s)

Hector E Salgado

Project Budget

£456,019.00

Summary

SGN currently deals with high volume gas escapes through applying one of a range of temporary solutions, which avoids contact with the pipe or intervention on the leak by Gas Operatives, as capturing the gas in a confined area (e.g. in the pit) increases the risk from explosions. Such gas escapes also have the potential to provide significant disruption in supply to customers.

- In effect, there are 3 issues that need responding to:
- Removing risk of explosion/injury to the public and operatives.
- Loss of gas.
- Ensuring continuation of supply to customer.

The aim of this project is to produce a range of options across several technology readiness levels (TRL) which will form the 'toolbox' of the project's name. This will enable SGN personnel to select a specific tool and dependent on the type of leak encountered use a procedure for its resolution. In Stage 1 these options were evaluated and by undertaking a wide technology review with a firm basis in the operational environment. Stage 1 also included a validation exercise where staff from SGN provided valuable feedback. This allowed for fast-tracking of selected options for further development in Stage 2.

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

SGN currently deals with high volume gas escapes through applying one of a range of temporary solutions, which avoids contact with the pipe or intervention on the leak by Gas Operatives, as capturing the gas in a confined area (e.g. in the pit) increases the risk from explosions. Such gas escapes also have the potential to provide significant disruption in supply to customers. In effect, there are 3 issues that need responding to:

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allowed for fast-tracking of selected options for further development in Stage 2.

High Volume Gas Escapes, although uncommon, pose a risk to individuals and infrastructure in their vicinity. The causes of HVGE are often by 3rd party damage but it is SGN's first responders and subsequent incident management team's responsibility to remedy the situation safely and quickly with as little damage to the surrounding environment as possible. It should be noted that disruption to customers can also pose a safety risk as many are heavily reliant on gas supplies for heating during the winter months.

Method(s)

This project aims to provide a solution which can quickly and effectively repair a leaking pipe at the leak's source. This project will therefore seek to identify and develop several solutions and develop the prototyped options for responding to high volume gas escapes for up to 2.0 bar systems.

In Stage 2 the selected concepts will be taken and developed further, carrying out the critical engineering design and development to create the first-generation tooling. This stage will deliver 'detailed prototypes' of the tools with associated methodologies, confirming the individual technologies most suited to different HVGE situations. This work will also include confirming the qualification route to field use.

As part of the work in Stage 2, a high-pressure high-flow test rig will be designed and manufactured. This will be valuable for the development of the tooling by enabling testing to be carried out in realistic environments. It is also expected that systems like this will be eventually used in training for use of the tooling in the field.

Scope

In Stage 2 the selected concepts will be taken and developed further, carrying out the critical engineering design and development to create the first-generation tooling. Key to the success of this Project will be the formation of a "Working Group", consisting of 5-8 core SGN staff taken from Policy and Operations teams. This group will provide informal and formal feedback and input throughout the project progression. The scope of this work will incorporate five phases:

- Working group set up
- Tool design
- Tool development generation
- Shop testing
- Technical qualification / accreditation

Objective(s)

The specific objectives for this project are:

1. **3 test rigs**

As HVGE are emergency situations, it is not possible to carry out planned 'field trials' of the tools. Therefore, test rigs will play a significant role in the development and validation of the tools. A high-flow rig for conveyance and entrainment tests and a high-pressure rig for sealing tests were developed in Stage 1. These will be supplemented with a high-force deployment rig (potentially using water and / or gas), to enable the concepts to be tested in a realistic HVGE scenario where continual high leak exit forces are present, especially at higher pressures.

The high-force deployment rig can be used subsequently for training purposes to expose end users to the experience of HVGE (the feel and sound) safely in a controlled environment. This will also give confidence to the end users when operating the developed concepts.

2. **Up to 7 individual tools contained within Toolbox**

The key objective for this Stage is to refine the concepts and to produce tested prototype versions of the tools. Eventually these will be used by SGN in conjunction with existing technologies to respond to HVGE events.

3. **Outline Operational Procedures**

Outline Operational Procedures will be developed for each of the prototypes. This will be carried out with support from the "Working Group" to ensure that they are most appropriate for the field use of the tools, and that any issues are highlighted as soon as is practical. This ensures that Operations is involved and assisted determining the optimum use of each of the tools

4. **Outline Potential Route to Technical Qualification**

The route to qualification / accreditation of each of the tools will be required to be fully understood by the end of Stage 2. The "Working Group" will support Steer in developing a plan to achieve Technical Qualification (and therefore field use). This plan will be actioned during Stage 3.

5. **Full reporting and witness testing**

Creating confidence in the tools within the field teams will be key to field deployment. Witness Testing and appropriate communication throughout the project with a set of key field individuals ("Working Group") will provide this. Reporting will be carried out as standard to allow Innovation to properly monitor the progress and outcomes of the work.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The success criteria for the project is as follows:

- Rig testing of prototypes for evaluation.
- Development of up to 7 prototype tools.
- Development and outline of operational procedures for their use.
- Outline potential route to Technical Qualification.
- Recommendations for Stage 3 and approval of SGN/PM/G/23 and field trial plan.

Project Partners and External Funding

N/A

Potential for New Learning

This project is expected to provide all network licensees with an understanding of the options when addressing high volume gas escapes quickly, safely and effectively.

Scale of Project

In Stage 2 it is expected to develop several prototype tools that will be tested on the various rigs. If the project progresses to field trials, these will take place at a selection of sites across SGN's network. The visits will allow SGN to assess the benefits of this innovative project and deliver learning as outlined above.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

The UK mainland.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

The total project expenditure will be £342,100 90% of which is allowable NIA expenditure (£307,890).

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)

In this Stage 2 the selected concepts will be taken and developed further, carrying out the critical engineering design and development to create the first-generation tooling. At this point it is difficult to quantify the potential financial benefits when the project is implemented. In general terms however, it is envisaged that deployment of this technology would lead to financial benefits in the following areas:

- Reduced Public Reported Escapes and associated costs.
- Risk reduction.
- Leakage reduction within the national leakage model.

Please provide a calculation of the expected benefits the Solution

N/A - This is a research project

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

High volume gas escapes are often time-consuming and costly to fix. Repairing the pipe is usually deemed unsafe, meaning that the pipe surrounding the leak must be replaced. The methodology proposed in this project aims to allow for safe repair of the leak and enable a controlled way of repairing the damage and therefore making the situation safer for operatives.

In Stage 2 the selected concepts will be taken and developed further, carrying out the critical engineering design and development to create the first-generation tooling. The results will be detailed in a Final Report, which will be made available to the other Network Licensees.

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. The technology readiness level at completion will enable an approximate estimation of the costs of deployment. However it will be necessary to undertake the field trials in the next 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 outputs will be presented in a clearly defined report that will be available on the Smarter Networks portal, allowing the network licensees to make informed choices as to whether to invest in this technology.

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

This will then allow Network Licensees to analyse internally where they foresee the benefits. It is expected that a toolbox that addresses HVGE events will be of value to the licensees

- 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 all other Network Licensees Innovation Funding Incentive, Annual Reports and NIA projects has been performed and no similar projects have been identified. A similar review of current academic literature and journals has also been performed to avoid any potential overlap with the current project.

SGN have also engaged with the project supplier and informed them that they must not work on another NIA project on the same topic with any other Network Licensees. The supplier has provided clarity that no unnecessary duplication of this project is currently being undertaken across GB.

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

It is innovative because it addresses HVGE events by selecting concepts that will be taken and developed further, carrying out the

critical engineering design and development to create the first-generation tooling.

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 is a research project and qualifies within the NIA governance framework.

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 is a research project and qualifies within the NIA governance framework.

This project has been approved by a senior member of staff

Yes