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# NIA Project Registration and PEA Document

### Date of Submission

Jun 2014

### Project Reference Number

NIA_SGN0052

## Project Registration

### Project Title

Core Drilling and Flow Stop, WASK

### Project Reference Number

NIA_SGN0052

### Project Licensee(s)

SGN

### Project Start

September 2014

### Project Duration

4 years and 4 months

### Nominated Project Contact(s)

Alex Stewart, Innovation Project Manager

### Project Budget

£219,285.00

### Summary

The scope of this project is to support development of equipment to undertake under pressure drilling, tapping and sealing through a 600mm diameter core excavation on 4-12" mains operating up to 2 barg.

The second phase of the project will support development of flow stop equipment designed to operate in a 600mm diameter core excavation allowing flow stopping and bypassing of affected mains from 4" to 8 " and operating up to 100mbar.

### Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

### Problem Being Solved

From the 1850's up until the 1950's metallic mains were used extensively across Great Britain's (GB) gas distribution network. Since then the gas industry has moved away from this source of material and is replacing those mains with polyethylene pipe, in order to reduce and eliminate risk of fracture, corrosion, and/or leakages. At present across Scotia Gas Network (SGN) there are approximately 5,000 kilometres of small diameter (Tier 1) metallic mains (<8") requiring replacement.

Throughout RIIO-GD1 Network Licensees are focussing attentions towards Tier 1 replacement activities as part of their total operating expenditure (TOTEX) targets. From 2013 and beyond, SGN have planned to undertake a large number of replacement projects per annum. Such activities are strategically planned with live/dead insertion accounting for a large proportion of these works. Due to the high density of Tier 1 distribution mains in areas of domestic dwellings, inevitably any works carried out will result in a considerable impact on our customers.

These activities currently require large excavation works to be undertaken on the carriageway causing disruption to traffic flows for extended time periods. These excavations also impact on the environment with the disposal of excavated material and the import of either virgin or recycled backfill material.

## Method(s)

Under the previous IFI initiative, SGN, successfully undertook a project to evaluate Core & Vac technology to assist in minimizing excavation sizes when carrying out joint repairs on metallic mains.

Following on from the IFI project's successful roll out and implementation, this project will develop equipment to allow both core drilling and flow stop operations to be carried out without the need for large excavation by designing the equipment to be used in conjunction with our core and vac equipment and small excavation initiative. It is intended that this will vastly reduce the impact on our customers, the environmental issues and also the associated costs.

The project will be carried out in two concurrent phases:

Phase 1

Design of equipment to GIS/E1 to allow underpressure drilling and tapping and sealing

Manufacture of initial prototype

Initial field trials

Development of design on the basis of feedback from initial trials

Finalise design, training and final field tests

Development of documentation

Phase 2

Design of equipment to GIS/E4 to allow flow stopping.

Manufacture of initial prototype

Initial field trials

Development of design on the basis of feedback from initial trials

Finalise design, training and final field tests

Development of documentation

Normally both under pressure drilling and tapping and flow stop are carried out in conventional excavations due to the size restrictions required by both processes. This involves large, time consuming excavations ranging from 2 – 4 metres in length depending on pipe configuration. This equipment would allow the flow stopping to be carried out using 4 core hole excavations (2 for twin bag insertion and 2 for the bypass) and a small excavation for the physical cut-off.

The benefits of this system when compared with conventional drilling and bag off equipment are:

- Reduction in volume of excavation
- Reduction in the number of drillings required to undertake the flow stop operation
- Minimise our works footprint
- Quickly reinstate the majority of the excavation works
- Reduces time both excavating and reinstating

Reduces costs minimise excavation size and, where core and vac is used, cores can be used as final reinstatement

## Scope

The scope of this project is to support development of equipment to undertake under pressure drilling, tapping and sealing through a 600mm diameter core excavation on 4-12” mains operating up to 2 barg.

The second phase of the project will support development of flow stop equipment designed to operate in a 600mm diameter core excavation allowing flow stopping and bypassing of affected mains from 4” to 8 “ and operating up to 100mbar.

A change to the project end date was made as a result of a delay due to manufacturing issues. These are predominantly due to sourcing a suitable manufacturer to cast the equipment prior to final manufacturing by WASK. This led to a delay in both the initial and final prototype models being available for sign off and testing. The prototype is now complete and testing is well underway, however the delay has meant an 8 month extension is required to allow for production of the field trial equipment and final reports to be completed.

The change is beneficial as the project will deliver learning as planned with no change in costs or potential net financial benefits.

A further change was required after development of the prototype equipment and initial offsite trials as it was identified that the extended length of the equipment led to problems when inserting and retrieving the bags. This led to a delay as the equipment was subject to further development to strengthen the separator and allow the extended bag rods to be guided safely into place. This change has now been completed and tested off site in both trials and training.

This change has led to a delay in the project meaning an additional extension of 8 months to the project to allow for completion of the field trials and equipment assessment.

Following this amendment, the objectives and success criteria of the project, as defined on registration, are anticipated to be met within the revised timescale and the benefits of the project outcomes realised by the GB gas consumer.

## Objective(s)

The objectives of this project are to:

· Ensure a safe and reliable gas supply for our customers and limit the size and duration of excavations to carry out our works

· Produce training material to be provided in support of field trials.

· Carry out field trials to comprehensively review the new equipment and provide a technical report for the other Licensees to disseminate the outcomes of the field trial.

· Evaluate suitability of new method against traditional techniques of drilling and flow stopping and record, review and report on performance of the equipment.

· Research and provide outcomes of the feasibility of rolling out the project across all SGN distribution zones and all of GB.

· Provide work instruction, training procedures and operating procedures for all equipment

· Detail costs benefit analysis from the field trials.

Issue approval of this technique for use across GB.

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

n/a

## Success Criteria

The success criteria for this project are to trial and test the method and equipment against the traditional methods currently used to compare its performance in terms of:

- Asses whether core drilling provides a safe, efficient and cost effective solution.
- Enable comparison of the effectiveness of the equipment versus existing equipment
- Indicate whether there is a reduction in the environmental impact when comparing existing equipment with that in the field trial.
- Judge whether there is a resultant Increase in productivity.

## Project Partners and External Funding

n/a

## Potential for New Learning

n/a

## Scale of Project

In order to ensure that learning associated with this project is maximised and that the future application of this technology is well understood, it is necessary to trial a good sample of mains and sizes across a number of site locations , both in Scotland and Southern to ensure a sufficient range of scenarios are covered. However, a decision has been made to limit the flow stop part of this project specifically to 4”- 8” diameter mains in order to best gauge practical feasibility of the system.

## Technology Readiness at Start

TRL2 Invention and Research

## Technology Readiness at End

TRL8 Active Commissioning

## Geographical Area

This project will be trialed in a number of depot locations using both core and vac and conventional small hole technology, in each of SGN’s regional networks; Scotland, South and South East England. The purpose of the trials being carried out in a number of depots is to ensure that the new technology is used extensively in varying environments, mains sizes and ground conditions to ensure the integrity of the findings.

## Revenue Allowed for the RIIO Settlement

During RIIO-GD1 it is estimated that OFGEMs proposed allowance for 2013-21 Replacement Tier 1-3 activities for all Network Licensees is approximately £5,195.2m. While no direct saving on this is expected during the project, it is anticipated that successful completion of this project could, in future, provide a significant cost reduction with regards to Tier 1 (25mm through to 180mm) replacement works as well as potentially reducing the time taken to complete our works on site.

## Indicative Total NIA Project Expenditure

The total project expenditure is £219,285, 90% of which is allowable NIA expenditure (£197,357).

# 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)

Along with a potential increase in operation safety and a reduction in customer disruption due to excavation sizes and durations, this project also has the potential to deliver substantial financial benefits. Although the benefits are difficult to quantify due to the diverse nature of mains replacement projects being undertaken, it is anticipated that potential cost savings on excavations could be in the region of 15% on the current spend. It is also anticipated that these savings could also be replicated throughout the GB gas Networks.

Deployment of this technique will lead to potential financial benefits in the following areas:

- Reduction in excavation sizes on the public carriageway
- Reduction in road waste to landfill
- Reduction of imported backfill and blacktop reinstatement material

Reduction in excavation and reinstatement timescales

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

Based on average statistics regarding mains replacement works across SGN local distribution zones, savings relating to revised excavation sizes using the new system we can make assume the following:

The key saving for this new system will be in the ability to reduce the excavation sizes for all mains replacement jobs. Currently excavations for **4" ≥ 6"** mains average **4.2m³** with a predicted cost of **£1,014.34** and mains **6" - 8"**, **9.4 m³** costing **£2,264.16**. The excavation sizes can be reduced to **1.8 m³** & **1.8 m³** respectively resulting in savings of **£279.34** and **£1,059.16**.

As part of the project it will be necessary to assess the feasibility and potential economic benefit of full roll outs both for SGN and across GB. Although it is infeasible at this stage to accurately determine the value of this system, we can assume on the basis that SGN has committed to over 1200 mains replacement projects per annum for the previous 5 years, and that each project averages >1km with multiple excavations, the potential for saving is substantial.

These costs are based on approximations of the existing and revised excavation sizes, however, it is envisaged that as the project progresses additional data will be collated to further increase the accuracy of the potential cost savings both for SGN and across GB.

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

Over the past 5 years SGN have completed, on average, >1200 replacement projects across Scotland and Southern licence areas per annum. Therefore, it is can be assumed that the other Network Licensees may have identified a similar proportion of replacement projects (based on network size) and therefore we would look to scale the savings value on a 4:2:1:1 basis. Taking this in account this project has the potential to be rolled out across GB and provide future savings in capital and operational costs associated with mains and service replacement, while improving asset integrity.

The above is assumed based on the nature of our current mains replacement programme. However, replacement activities across all Network Licensees and sites will vary, this may affect the potential to apply the method and the potential benefits associated with it. The main focus of this project is to research, design, develop and manufacture new keyhole technology solutions to minimise the excavation sizes when carrying out specific operations and to understand and quantify the potential benefits associated with the technology.

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

As the number of replacement projects is unknown across GB it is difficult to determine the exact roll out

costs. However, it is known that there will be costs associated with sharing the results and learning of this project. SGN will continue to share project progress throughout the duration of the project with the other Network Licensees.

Upon successful completion, Network Licensees will make a decision on whether to implement this solution throughout their organisations. Excluding the cost of purchasing the equipment, it is anticipated that the only foreseeable costs will revolve around the training costs for operatives although since this is an evolution of an existing technique it is likely operatives will have some familiarity with both the existing technique and equipment which should be easily transferable to the new technique and equipment. This transfer should mean a minimum amount of training will be required.

At present it is unclear as to how many operatives will be trained and how Network Licensees would choose to deliver training. More accurate quantification of roll out costs will be possible once the project is underway and the changes are identified and quantified.

## 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 from this project will allow network operators to evaluate the benefits of using the core drilling and flow stopping equipment. If successful this technique would minimise the excavation sizes required to complete the operations mentioned, reducing costs and improving customer experience by reducing disruption and the time which our excavations require to remain open before completion.

### 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