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

Sep 2015

Project Reference Number

NIA_SGN0082

Project Registration

Project Title

Automated Regulator Maintenance (ARM) (Phase 1)

Project Reference Number

NIA_SGN0082

Project Licensee(s)

SGN

Project Start

September 2015

Project Duration

3 years and 5 months

Nominated Project Contact(s)

Mark Skerritt, Innovation Project Manager

Project Budget

£733,260.00

Summary

The scope of phase 1 of this Project is to evaluate the Wigersma & Sikkema Plexor inspection system and its application in the Great British (GB) gas network, ensuring compliance with relevant Legislation, British, European and industry standards.

The Project has been broken down into a number of potential phases, with phase 1 the only phase to be scoped out fully at this time:

Phase 1: Assessment of Wigersma & Sikkema Plexor System

- Review of Plexor system design
- Production of SGN/PM/G/17 and SGN/PM/G/23 documentation
- Onsite field testing of Plexor system
- Identify data management method and asset management protocol
- Review and evaluation of the outputs from Phase 1

Future phases will be scoped out and subsequently registered following the success of phase 1:

Phase 2: Prototype System Design, Development and Review

Phase 3: Prototype System Validation and Field Trial

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

Throughout RIIO-GD1 Network Licensees are considering maintenance activities as part of their total expenditure (TOTEX) targets. SGN carries out a number of maintenance activities daily across its 7973 regulator sites. These are completed at periodic times thought out the year for pressure reducing assets operating at pressures up to 7 bar and above and are based on a mixture of Reliability Centred Maintenance (RCM) and risk-based maintenance systems. Traditionally these maintenance activities are completed manually by trained operatives who follow a set of maintenance instruction onsite, assessing the equipment for its performance against known parameters. However, these results can be open to interpretations by each trained individual to assess whether it meets the pass or fail criteria.

SGN are now looking to develop a more advanced innovative solution to further improve and modernise the capabilities of maintenance activities, through the introduction on an Electronic Regulator Diagnostics system that can be operated both remotely and manually, with the ability to be developed further to provide a augmented feature that would be used on site to assist in any possible repairs that may occur. This project will inform SGNs Asset Management team of the potential product advantages compared to current practice and how it will perform on SGN's network.

Method(s)

The Project will look to evaluate a more advanced innovative solution, known as the Wigersma & Sikkema Plexor inspection system. This system is an Electronic Regulator Diagnostics system that can be operated both remotely and manually to further improve the operational safety and efficiency measures, as well as modernise the capabilities of maintenance activities.

The aim of the Project is to:

- Trial the Plexor inspection system on a regulator stream ranging in pressures form 0.4 – 75 bar, semi-automatically onsite and remotely using Global Positioning System (GPS) as a location mark.
- Trial a number of predefined maintenance tasks automatically.
- Assess the data accuracy of the results and readings.
- Monitor productivity of maintenance operatives on site.
- Explore single man working on certain sites.
- Compile a historical register of faults and their repair methods and evaluate the likelihood of developing a live step by step augmented repair process for the operative to follow onsite.
- Assess the possibility of being able to create a live link with a technical expert who can assist in diagnosing problem areas.

Overall the Project will evaluate the Plexor inspection system and new techniques that could be used in improving the high cost of maintenance activities, future skills issues and modernising of SGNs maintenance philosophy. This could potentially transform the way in which the industry maintains their pressure reduction assets in the future.

Scope

The scope of phase 1 of this Project is to evaluate the Wigersma & Sikkema Plexor inspection system and its application in the Great British (GB) gas network, ensuring compliance with relevant Legislation, British, European and industry standards.

The Project has been broken down into a number of potential phases, with phase 1 the only phase to be scoped out fully at this time:

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Phase 2: Prototype System Design, Development and Review

Phase 3: Prototype System Validation and Field Trial

In May 2017 it became apparent that additional time and effort would be needed by all Project Partners to ensure sufficient technical detail could be made available to complete the production of the necessary SGN/PM/PS/5 (formerly known as SGN/PM/G17) and

SGN/PM/G/23 documentation; although at the time it was still envisaged that it would be possible to keep to the original project forecast of completing in September 2017 as planned. Following an initial general review of the various governor configurations installed across SGNs Networks it was decided to trial the Plexor system on a common, but inherently complex Auxiliary Controlled Governor configuration. However, as the Project progressed it became apparent that the main Project Partner had little or no experience of this type of Governor configuration. And a significant amount of additional work ensued to develop the partners understanding to the extent that they could then revise their general process and procedure for applying the Plexor system effectively to an Auxiliary Controlled Governor configuration. However, by August 2017 and following an extensive review of the main Project Partners proposed Test Procedure for applying Plexor to an Auxiliary Controlled Governor configuration in SGNs Scotland Network, SGN considered that another 'alternative' approach could have better viability; this new approach still made full use of Plexor, albeit through using a more radical application than the main Project Partner was used to, but it appeared to significantly simplify the general approach, potentially superseding the main Project Partners proposal. All parties have now agreed to give this alternative notion serious consideration, to the extent that a revised Test Procedure adopting the new approach has now been devised in detail for the targeted Auxiliary Controlled Governor configuration in Scotland and this approach will be the preferred option when it comes to testing. However, reaching this point has taken much longer than expected and it has now been established that at least twelve more months will be necessary to complete the project and proceed to field trials.

Objective(s)

The objective of this Project is to review the existing Plexor system designs, as well as trial the equipment on a regulator stream ranging in pressures form 0.4 – 75 bar, semi-automatically onsite and remotely using GPS to determine the systems capabilities in live environmental conditions.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

This Project phase will be deemed to be successful if the following outcomes are achieved:

- Undertake an assessment and review of the Plexor system design.
- Produce SGN/PM/G/17 and SGN/PM/G/23 documentation detailing the correct operating procedures, risk assessments and methodology to be applied for the trials.
- Development of an associated training packages for the onsite trials.
- Carry out onsite field trials of the Plexor system.
- Identify and assess the data management method and asset management protocol
- Produce and disseminate learning based on final Project report.

Project Partners and External Funding

None

Potential for New Learning

This Project on completion of all phases is expected to offer Network Licensees with a new innovative electronic regulator diagnostic system solution for above and below ground assets. It will provide a more efficient maintenance solution which could be more cost effective compared to the traditional techniques. SGN aims to disseminate the learning from each phase of this Project via technical reporting and practical demonstrations (if required). This may enable cost reductions and improvements to Network Licensees by potentially transforming the way in which the industry maintain their pressure reduction assets.

Scale of Project

The Project has been split into three phases. The aim is to run each phase consecutively. A number of trials shall take place with differing pressures and configurations. These trials are expected to run throughout the duration of the Project, in SGNs Scotland, South and South East England networks. The field trials will allow SGN to assess the benefits of this innovative solution and deliver learning as outlined above.

The Project duration identified for phase 1 allows both SGN and the project partner to carry out all acceptance and evaluation work prior to advancing the use of the system further within the GB gas industry. There would be less potential for learning if the scale of the

Project was any smaller than this.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL6 Large Scale

Geographical Area

All laboratory research, design work and assessment of the Plexor inspection system for phase 1 will be carried out in Wigersma & Sikkema facility in Holland. All equipment will then be transported from Holland to suitable live trial sites located in Scotland and South and South East England. The live testing trial sites have yet to be identified.

Revenue Allowed for the RIIO Settlement

For the remainder of the RIIO-GD1 period it is estimated that OFGEM proposed allowance for Maintenance activities for SGN is approximately £168.2m. While no direct saving on this is expected during the Project, it is anticipated that successful completion of this Project could in future potentially provide all Network Licensees with a sufficient cost reduction saving solution with regards to Maintenance.

Indicative Total NIA Project Expenditure

The total predicted project expenditure is £733,260, 90% of which is allowable NIA expenditure (£659,934).

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)

It is expected that this Project could provide Network Licensees with an opportunity to make cost savings on maintenance and inspection activities. This will provide net financial benefits to customers as a result of the improvements made to the existing method of maintaining the integrity of the assets and equipment.

In addition to the operational, safety and customer impact benefits of this Project, the development of this technology and equipment has the potential to deliver financial benefits.

SGN carries out a number of maintenance activities daily across its network on 7937 regulator site at periodic times though out the year. This is based on a mixture of RCM and risk-based maintenance systems for pressure reducing assets operating at pressures up to 75 bar.

Please provide a calculation of the expected benefits the Solution

Throughout RIIO-GD1 it is anticipated that the predicted spend to carry out such works is £4,110,442 per annum. See below:

- SGN maintains 344 National Transmission System (NTS)/Above Ground Installations (AGI)/Local Transmission System (LTS) (above 7bar) sites @ an estimated yearly cost of **£2,764,650**
- SGN maintains 7629 (below 7bar) sites @ an estimated yearly cost of **£1,345,792.**

The benefits of deploying this in terms of cost savings will vary depending on the type and scale of maintenance activity being undertaken. Based on early assumptions, the average cost savings over and above traditional activities is estimated to be 15%. This estimate is subject to a large sensitivity margin as it is based on averages and also depends on the actual outcomes of the Project. However the project partners has provided supporting guidance on this assumption.

Base Case Cost - £4,110,422 (Current solution/method of operation for RCM and risk-based maintenance systems for pressure reducing assets operating at pressures up to 75 bar)

Method Case Cost - £3,493,876 (Potential new solution/method of operation)

Therefore, £4,110,422 - £3,493,876 = £616,566 (Benefit Estimation for Development) per annum using the Electronic Regulator Diagnostics system.

Once the Plexor inspection system has been trialed, a more accurate cost analysis will be carried out using the field trial findings.

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

Similar to SGN, the other Network Licensees have been provided with an allowance for Maintenance in their RIIO-GD1 proposals and it is envisaged that this Project does have the potential to be rolled out across GB and provide future savings in the capital and operational costs associated with maintenance activities on the network.

If the figures above were to be mirrored in future years and a 4:2:1:1 split was applied with reference to the size of each network, it is assumed that a total saving of approximately £2.46m per annum could be achieved.

However, it must be noted that these figures and assumptions are based on estimates and the nature of maintenance activities across all Network Licensees and sites will vary, which could affect the potential to apply the method and the benefits of applying it. The main focus of this project is to research, design, develop and field trial a new innovative maintenance solution and understand the potential benefits.

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

As the number of maintenance inspections and tests across GB is unknown, it is difficult to determine the exact roll out costs. It is anticipated that the cost of disseminating the learning outcomes and findings from the Project would be approximately £45,000 for SGN (including training costs). Based on the 4:2:1:1 split (applied with reference to the size of each network) it is estimated that the total cost of training before the equipment can be used operationally throughout GB would be £180,000. This estimate is based on an assumption of training courses and operatives per Network Licensee, provided by the project partner and is subject to change.

SGN will continue to share Project progress throughout the duration of the Project with the other Network Licensees.

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 benefit all Network Licensees. If the Project leads to successful development of a more cost effective and less disruptive solution to the problem of maintenance activities, other Network Licensees will be able to use the learning generated to embed this new solution in their businesses, make informed decisions and ultimately reduce the cost of maintenance inspections and tests.

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 all other Network Licensees' Innovation Funding Incentive Annual Reports has been performed, along with a review of the Smarter Networks Portal and no similar Projects have been identified. A similar review of current literature and journals has also been performed by the Innovation Project Manager to avoid any potential overlap with the current Project. Nothing of this nature has been done in GB.

As the first Network to develop this technology for GB, we have and will continue to share our learning with the other Network Licensees.

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