

## NIA Project Registration and PEA Document

### Date of Submission

Jan 2018

### Project Reference Number

NIA\_SGN0117

## Project Registration

### Project Title

Bolt Integrity

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NIA\_SGN0117

### Project Licensee(s)

SGN

### Project Start

January 2018

### Project Duration

1 year and 6 months

### Nominated Project Contact(s)

Phil Bradwell, Innovation Project Manager

### Project Budget

£108,153.00

### Summary

SGN NIA project to inspect bolt condition and trial reinforcement clamp.

### Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

### Problem Being Solved

Hundreds of thousands of stud bolts are used across SGN network and all other Gas Distribution Network and play an important role in the integrity of our network. It has been identified during site inspections that a number of stud bolts have significant level of corrosion and require urgent replacement.

Current methods of bolt replacement can be expensive. It is acceptable to replace stud bolts from an 8 bolt flange arrangement during live operation, however this is not possible for 4 bolt flange arrangements, meaning an expensive bypass option is required. Hydratight have developed a clamp which allows stud bolt on a 4 bolt flange arrangements to be replaced under live conditions.

Stud bolts are not a recorded asset and it is unknown; what condition they are in; how many require replacement; and what the remaining strength of the stud bolts are. Because of this, SGN are looking to develop a screening tool to identify the remnant strength of a corroded stud bolt.

### Method(s)

The project consists:

- Complete offsite trials and onsite live trials of the reinforcement clamp.
- Complete SGN/PM/G23 for reinforcement clamp.
- Removal of stud bolts using reinforcement clamp on live site.
- Complete a variety of offsite testing to calculate the corroded cross sectional area and the remaining strength of the stud bolts.
- Development of a screening tool documenting evidence from offsite testing. This will be developed into a user guide based on bolt conditions, operating parameters and all other relevant details.

- Development of a bolt replacement procedure and training instructions.
- Submission of a final project report with full details of the work and testing done throughout the project.

## Scope

The aim of this project is to carry out investigation to develop an understanding of how corrosion affects the strength of a stud bolt and to see if it can be approximated by the cross-sectional area of the uncorroded material. In order to determine the replacement extension for bolt within plants and pipelines, a screening tool will identify the high risk bolts to replace. To do this, specimens will be removed from site using the Hydratight Reinforcement Clamp, and will be subjected to various tests. These tests will determine the remaining strength left in a corroded bolt and cross referenced to understand if there is a visible trend.

## Objective(s)

The objectives of this project are to:

- Complete offsite trials and onsite live trials of the reinforcement clamp.
- Complete a variety of offsite testing to calculate the corroded cross sectional area and the remaining strength of the stud bolts.
- To give a quantitative measure for the corrosion as a percentage of metal loss or cross sectional area.
- Development of a screening tool documenting evidence from offsite testing. This will be developed into a user guide based on bolt conditions, operating parameters and all other relevant details. Understand how the corrosion affects the remnant strength and life in the bolt.
- Develop a bolt replacement procedure and training instructions.

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

n/a

## Success Criteria

The success criteria for the project is to develop a better understanding of the condition and remaining strength left in stud bolts. The project will involve:

- Trialling of the reinforcement clamp.
- Creating an understanding of the relationship of the corroded cross sectional area and the remaining strength of the stud bolts.
- Full project report with Conclusions and Recommendations.
- Develop a bolt replacement procedure and training instructions.

## Project Partners and External Funding

Hydratight

## Potential for New Learning

This project aims to develop a solution to an existing problem that has never been adequately addressed before. The Project is expected to develop the following new learning for Network Licensees:

- Awareness of a method and product for replacing stud bolts on 4 bolt flange arrangement.
- Understanding of the costs and benefits of the method and product.
- Whether the methodology has the potential to be adapted to suit other types of applications.
- Develop awareness of the potential impact of corrosion on stud bolts.
- Develop awareness of the condition and remaining strength left in stud bolts.

## Scale of Project

The project involves onsite live trials of the reinforcement clamp using the Hydratight Clamp Arrangement. Following from this offsite testing will be carried out to calculate the corroded cross sectional area and the remaining strength of the stud bolts.

## Technology Readiness at Start

TRL2 Invention and Research

## Technology Readiness at End

TRL3 Proof of Concept

## Geographical Area

The field trials will take place in Scotland and Southern SGN Sites. Offsite testing will take place by Hydratight in Scotland. If proven successful the clamp can be deployed around the UK.

## **Revenue Allowed for the RII Settlement**

There is no initial revenue for this project, however after creating a condition screening tool it will indicate which bolts require urgent replacement. By testing the Hydratight 4 bolt clamp arrangement it has the potential to avoid large cost bypassing methods.

## **Indicative Total NIA Project Expenditure**

The total project expenditure is £90,150, 90% (£81,135) of which will be recovered via the NIA funding mechanism in line with the funding conditions.

## 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 if successful this project could provide Network Licensees with an opportunity to make saving on repairs. Therefore providing net financial benefits to customers, as a result of the improvements made to the existing method of maintaining the integrity of the pipework and equipment.

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

This is not applicable as it is a research project.

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

There are hundreds of thousands of stud bolts used across SGN network and all other Gas Distribution Network. Therefore this project would apply to the majority of SGN and the Network Licensees.

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

It is anticipated that the cost of disseminating the development outcomes findings from the project and training costs incurred before the screening assessment can be used would be approximately £2,000 for SGN. Based on a 4:2:1:1:1 the estimate<sup>4d</sup> total cost of training before equipment can be used operationally throughout GB would be £9,000.

### 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 Network Licensees as it will provide them with a clear evaluation of how corrosion affects the life of a stud bolt. If successful the learning from the project will allow Network Licensees to make informed decisions on whether they would like to adopt our screening/ replacement bolt procedure.

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

Reliability, maintenance, materials and corrosion control.

The project will improve extending asset life.

☒ 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 has been made of all other Network Licensees and no other similar projects have been carried out.

### 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