

## NIA Project Registration and PEA Document

### Date of Submission

Jul 2018

### Project Reference Number

NIA\_NGGT0131

## Project Registration

### Project Title

Overpipe geogrid protection against third party damage

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NIA\_NGGT0131

### Project Licensee(s)

National Gas Transmission PLC

### Project Start

July 2018

### Project Duration

1 year and 7 months

### Nominated Project Contact(s)

Paul Ogden

### Project Budget

£37,078.00

## Summary

Third party damage is the highest risk to the National Transmission gas pipelines. The costs of repairs and disruption are always significant, typically in the range of £30k to £M's especially if the pipeline has to be shut down whilst the damage is repaired. Reduced depth of cover and shallow ditch crossing are increasingly being identified e.g. from pipeline walking surveys. Several innovation projects have been and others are being progressed to mitigate against third party damage, e.g. the use of PE slabs and in-line depth of cover assessments and some of these are already in use.

Arising from research for these innovation projects, the 'overpipe' net solution, already in use in parts of Europe, was identified. The technology comprises of a high strength yellow geo-fibre net grid that is very visible to excavator operators whilst restricting the dig capabilities of the excavator bucket and minimizing the likelihood of deeper excavation.

## Preceding Projects

NIA\_NGGT0097 - Permanent PE slab protection

## Third Party Collaborators

DNV

## Nominated Contact Email Address(es)

Box.GT.Innovation@nationalgrid.com

## Problem Being Solved

Third party damage is the highest risk to the National Transmission gas pipelines. The costs of repairs and disruption are always

significant, typically in the range of £30k to £M's especially if the pipeline has to be shut down whilst the damage is repaired.

Reduced depth of cover and shallow ditch crossing are increasingly being identified e.g. from pipeline walking surveys. Several innovation projects have been and others are being progressed to mitigate against third party damage, e.g. the use of PE slabs and in-line depth of cover assessments (NIA\_NGGT0085). PE slabs have been successfully implemented as an impact protection measure for NTS pipelines that cross ditches at a shallow depth. The curved PE (NIA\_NGGT0097) will protect the shallow pipelines in fields against damage caused by agricultural activity.

Arising from research for these innovation projects, the 'overpipe' net solution, already in use in parts of Europe, was identified. The technology comprises of a high strength yellow geo-fibre net grid that is very visible to excavator operators whilst restricting the dig capabilities of the excavator bucket if snared and hence minimising the likelihood of deeper excavation.

## Method(s)

To understand the effectiveness of the geo-grid a series of tests using an excavator will be performed on a grid installed above a pipeline.

The test set up is likely to comprise of a 12m length of 36" diameter pipe installed in a trench at typical minimum depths to the top of the pipe, i.e. 1.1m. The trench will be backfilled with the indigenous soil (ungraded). At a depth of 0.5m from ground level, a 20m length of the geo-grid mesh will be installed. The remaining 0.5m of backfill will be added over the geo-grid.

A 32 tonne tracked excavator (typically the largest size commonly used in pipeline construction) will be used to perform the tests on the geo-grid. The excavator will attack the pipeline using a digging bucket fitted with teeth at a number of prescribed locations on the grid as performed during the European (TIGF) trials.

These interventions will be recorded from two locations using video and photographed to record how the geo-grid behaves and if it prevents contact with the pipeline. The video clips, photographs and a report of the findings will be produced and issued as deliverables to National Grid, together with a financial analysis of the products use.

The outcomes from the field trials and tests will propose the appropriate changes required to specifications to ensure incorporation of the innovation product into future new build projects together with consideration of the measure as a retro-fit option on existing pipelines where a higher than normal risk of third party damage has been identified, e.g. in areas where construction work is planned adjoining an NTS pipeline.

## Scope

Following the success of PE slabs, it has been identified that in the case of new installation and diversions, there is currently no protection routinely placed above pipelines to deter damage.

A study carried out by Gaz de France determined that earth moving construction machinery represents the majority of risks to which a pipeline is subjected. Protection placed above the pipeline, in addition to the modest load distribution role during the passage of construction machinery, can reduce this type of risk by informing the earthmoving construction machinery operator. The difference in resistance between the ground and the mechanical protection alerts the construction machinery operator of the presences of an underground construction and encourages prudence.

Therefore, National Grid wish to investigate the use of geo-grid installed above a pipeline to protect against intervention.

## Objective(s)

To trial and demonstrate the suitability of overpipe geo-grid protection. The method can then be used by National Grid in future new build projects, diversions and existing pipelines where a higher than normal risk of third party damage is identified.

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

n/a

## Success Criteria

Prove effectiveness of the pipeline geo-grid and confirmation that it provides an early warning to excavator operators of the presence of the pipeline.

## Project Partners and External Funding

Potential for New Learning

The new learning will be to ascertain if the geo-grid protects the pipeline against interventions when excavations are carried out.

Scale of Project

Mostly field based, involving the over mesh geo-grid protection being placed on a pipeline at an established testing site and once proved can be used on an operational site.

Technology Readiness at Start

TRL5 Pilot Scale

Technology Readiness at End

TRL9 Operations

Geographical Area

DNV GL facility at Spadeadam.

Revenue Allowed for the RIIO Settlement

None (to be confirmed RIIO Delivery)

Indicative Total NIA Project Expenditure

£37,078

## 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)

With the introduction of the new over pipe protection will avert potential increase in costs by pre-emptive actions.

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

Fixed pipeline protection systems are designed and implemented to minimise the accidental damage. Applying the over pipe geo-grid solution will offer another technique to mitigate potential pipeline damage.

Thus, geo-grid will provide mitigation against third party interference of the pipeline in the following scenarios:

No Loss of containment but pipeline damage: - Costs related to repair and loss of capacity will vary depending on numerous factors but excavation, section removal and network restoration will be in excess of £500k rising to several £Ms if the damage is along extensive lengths of pipe section.

Loss of containment: - Potential loss of life. Financial and reputational impacts will be significant.

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

This is fully replicable to all utilities as the high strength yellow geo-fibre net grid is visible to excavator operators by restricting the dig capabilities whilst protecting the pipeline against damage when excavating around live pipelines.

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

This will be ascertained as part of the project, but is not a significant cost relative to the cost of pipeline construction. If implemented on planned diversions, the additional cost would predominantly be for the geo-grid material and labour for installation as part of the standard backfill operation.

### 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

#### RIO-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

By using this technique Network Licenses will be able to deter damage to pipeline as earth moving machinery operators will detect the difference in resistance between the ground and the mechanical protection.

The demonstration of the geo-grid system as an early warning underground asset protection technique will be readily transferable to all Network operators who operate and maintain underground pipe/cable infrastructure (Gas, Electricity & Water utilities). The potential protection capability of geo-grid and the comparative ease of installation will enable all Network operators to implement the findings of this programme.

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

In the March 2018 Gas Innovation Strategy document; this would address some of the key features in Theme 2 – Safety and Emergency.

- ☒ 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.

Innovation projects have been or are now in progression to mitigate third party damage these projects are PE slabs which has been successfully implemented to protect NTS pipelines that cross ditches at a shallow depth. The curved PE (NIA\_NGGT0097) will protect the shallow pipelines in fields against damage caused by agricultural activity.

This technique of laying a geogrid mesh over a pipeline is to restrict the dig capabilities for the excavator bucket where there is a higher than normal risk of damage occurs when new builds projects, diversions are carried out to minimise the likelihood of deeper excavations, the method has never been used in the UK, therefore no duplication has occurred.

**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**

This technique has not been used in the UK on gas pipelines. This technique was developed in France and the mesh complied with/and approved by the Transport et infrastructures Gaz France (TIFG) and is now required as part of their standard operations.

**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**

The demonstration of the geo-grid technique requires a comprehensive set of evaluations to be undertaken which forms the scope of this programme to ensure a full understanding of the mesh's capability is derived. For example, the interaction of the geo-grid with the excavator and the impact on surrounding soil need to be evaluated to ensure that subsequent remedial works are conducted appropriately. This work is best conducted through the innovation framework as it allows all network operators to benefit from the findings. Once proven, then the geo-grid technique will become implemented across the business and integrated in to National Grid's civil engineering standard T/SP/CE/12, "The Design, Construction and Testing of Civil and Structural Works Part 12: Protection Works Over Steel Pipelines".

**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**

The risk that the overmesh geo-grid will not mitigate damage to the pipeline or the material is not fit for purpose, so carrying out tests will clarify its suitability so that National Grid and all relevant network licenses are able to use this technique.

**This project has been approved by a senior member of staff**

☒ Yes