national gas transmission

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

Nov 2014

Project Reference Number

NIA_NGGT0068

Project Registration

Project Title

Risk Assessment Methodologies for Pipelines and AGI's 2014

Project Reference Number

NIA_NGGT0068

Project Licensee(s)

National Gas Transmission PLC

Project Start

April 2014

Project Duration

1 year and 1 month

Nominated Project Contact(s)

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Project Budget

£75,200.00

Summary

High-pressure natural gas system is a complex combination of buried pipelines and above-ground installations (AGIs), such as compressor stations and terminals. These assets present potential major hazards, such as fire risk, in the unlikely event of accidental releases of gas, due to a range of causes. But there is particular risk present due to accidental interference damage by third parties. Under the Pipeline Safety Regulations (PSR), National Grid is required to manage the risks associated with these assets effectively, and to be able to demonstrate to HSE that risk is considered as low as reasonably practical (ALARP). The Joint Industry projects comprise of a group founded in 1994 with collaboration gas transporters including National Grid (UK), Energinet.dk (Denmark), Fluxys (Belgium), Enagas (Spain), Gasunie (The Netherlands), TransCanada PipeLines (Canada), Alliance Pipeline (Canada/USA), KOGAS (Korea) and Statoil (Norway).

Preceding Projects

NIA_NGGT0007 - Risk Assessment Methodologies for Pipelines and AGI's

Third Party Collaborators

DNV

Nominated Contact Email Address(es)

Box.GT.Innovation@nationalgrid.com

Problem Being Solved

The continuous management and improvement of safety risks on high pressure gas pipelines and above ground installations requires development of wide ranging models and procedures. As the type of event which affects such assets is of low frequency, but has extremely high consequences it requires accurate models to make safety decisions and keep risks as low as reasonably practicable. Historically, the efficient development of these models and procedures has been coordinated through joint ventures. The maintenance and participation in these joint venture initiatives offers considerable benefits in terms of the latest thinking, financial leverage and best practice. Proposed activities for 2014/15 are as follows:

1. Hazard and Risk Assessment Methods for Gas Transmission Pipelines
2. Data for Failure Frequency Estimation for Use in Risk Analysis
3. Hazard and Risk Assessment Methods for Above-Ground Installations
4. Ground Movement Threats to Pipelines

Method(s)

Description	NGG Participant Contribution (£k)	Contribution from External Partners (£k)
A. Hazard and Risk Assessment Methods for Gas Transmission Pipelines	24.3	83.7
B. Data for Failure Frequency Estimation for Use in Risk Analysis	13.7	28.4
C. Hazard and Risk Assessment Methods for Above-Ground Installations	2.7	61.6
D. Ground Movement Threats to Pipelines	3.1	15.5
Total	**£ 59.2k***	**£189.2k**

* Excludes internal and dissemination costs

Scope

High-pressure natural gas system is a complex combination of buried pipelines and above-ground installations (AGIs), such as compressor stations and terminals. These assets present potential major hazards, such as fire risk, in the unlikely event of accidental releases of gas, due to a range of causes. But there is particular risk present due to accidental interference damage by third parties. Under the Pipeline Safety Regulations (PSR), National Grid is required to manage the risks associated with these assets effectively, and to be able to demonstrate to HSE that risk is considered as low as reasonably practical (ALARP). The Joint Industry projects comprise of a group founded in 1994 with collaboration gas transporters including National Grid (UK), Energinet.dk (Denmark), Fluxys (Belgium), Enagas (Spain), Gasunie (The Netherlands), TransCanada PipeLines (Canada), Alliance Pipeline (Canada/USA), KOGAS (Korea) and Statoil (Norway).

A. Hazard and Risk Assessment Methods for Gas Transmission Pipelines - The PIPESAFE Joint Industry Project (JIP) provides the tools to assist National Grid in discharging its obligations by developing and refining techniques for quantifying the risk associated with pipeline assets. The objective of the collaboration was to develop a risk assessment software package for gas transmission pipelines, and included undertaking large-scale experiments to validate the predictions of individual models within the package. New versions of the package continue to be developed under an annual agreement, as directed by the Steering Committee of the PIPESAFE Group, formed from representatives of each of the ten participating companies. In the period covered by the current proposal (2014–15), the PIPESAFE JIP includes the following:

- Review of the applicability of PIPESAFE to natural gas/hydrogen mixtures.
- Development of a refined methodology for assessing risk at pipeline river crossings.
- Preparation of an updated version of PIPESAFE, which will be issued to all the Participants, incorporating the latest changes and improvements to the package, and preparation of an updated publicly-available document for PIPESAFE, to be used to disseminate the latest findings and to describe the current structure of the package.

Included within the scope of this task there is also a task to keep a watching brief on new developments being made in the PIPESAFE collaboration and other pipeline safety-related studies, including ongoing collaborations and work performed via the UKOPA Risk Assessment Working Group, which could have an impact on the standard methodology specified for use in National Grid pipeline risk assessments.

B. Data for Failure Frequency Estimation for Use in Risk Analysis - A key component of risk analysis is the predicted frequency of failure. Historical data provides an important means of ensuring that appropriate values are used, based on experience. However, an individual company rarely has sufficient experience for meaningful analysis of the frequency of major accidents. By pooling experience with other companies operating similar assets in similar ways, a combined body of data can be used which provides sufficient exposure for analysis of frequencies. The project includes National Grid's participation in two international Joint Industry

Projects to facilitate the sharing of data by gas pipeline companies operating similar assets in similar ways, in order to provide sufficient data for investigation and analysis:

· Failure Frequency Analysis (FFA) project –gas release incidents for onshore gas transmission pipelines

· AGI Failure Frequency (AGIFF) project –gas release incidents for high pressure gas above-ground installations.

C. Hazard and Risk Assessment Methods for Above-Ground Installations - The ORDER Joint Industry Project (JIP) has nine companies collaborating on the development and maintenance of the ORDER software package for consequence and risk assessment of gas facilities including AGIs (Above Ground Installations) ORDER is a knowledge-based software package, designed for application in the natural gas industry to calculate the consequences of releases of hazardous material, in particular high pressure natural gas, from onshore plant. In addition, ORDER can perform Quantified Risk Assessments (QRAs) for selected scenarios. The package contains a suite of mathematical models, capable of predicting the various processes associated with gas or liquid releases, including transient outflow; dispersion, accumulation and liquid spread; fires and explosions and their effects on people, equipment and buildings. There are also models for estimating frequencies of equipment failure and impact, as well as risk summation routines. Collaboration with other companies helps to reduce the cost and also to learn from the experiences of other pipeline companies and to share best practice. In the period covered by the current proposal (2014–15), the ORDER JIP includes the following:

- Review and recommendations for the use of ORDER to assess the potential for escalation due to engulfment of above-ground pipework by fires on onshore gas installations.
- Implementation of a method for evaluating the worst case ignition location for confined explosions within building on onshore gas installations.
- Preparation of an updated version of ORDER, which will be issued to all the Participants, incorporating the latest changes and improvements to the package and a summary report of the activities undertaken during the year will be prepared and issued.

D. Ground Movement Threats to Pipelines - Ground movement is recognised as a significant threat to gas transmission pipelines, presenting the possibility of failure as ruptures (that dominate risk). The pipeline risk assessment methodology followed by National Grid and documented in HAMM Pipelines now includes a requirement to consider the contribution from this cause. This project will develop recommendations and best practice for the detection, management and mitigation of ground movement issues affecting pipelines to support National Grid in managing and reducing that risk. The scope of the Phase 1 project includes the following tasks:

· Identify modes of ground movement and develop a risk rating matrix for pipelines.

· Identify how causes of ground movement may be mapped and likelihood predicted.

· Identify how the effect of ground movement on pipeline integrity may be assessed.

· Identify types of mitigation measures that may be used to combat effects of ground movement.

· Compare international pipeline design standards and guidance for ground movement effect.

· Identify ways of instrumenting and monitoring ground movement and pipeline stress state.

· Identify types of warning systems available and identify types of remediation measures.

This project will be completed at the end of 2014, when the final deliverable will be a report summarising the state-of-the-art in terms of monitoring and managing ground movement issues affecting pipelines.

Objective(s)

Research into the enduring management of safety risks on pipelines and above ground installations. The project includes the implementation of the results via tools and methodologies that are aligned specifically to National Grid's needs but are also relevant to the UK gas industry, utilising the results of the international collaborations as appropriate.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Through collaboration with other gas transmission companies, National Grid is able to demonstrate to the safety regulator, its customers and the general public, through its safety cases, that its knowledge of gas transmission hazards and risks is at the forefront of current thinking and therefore that its safety cases are credible and realistic.

Such collaboration also allows National Grid to participate in, and benefit from:

- The ongoing development of international best practice in risk management.
- Shared learning from incidents.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

Participation in collaboration research programmes such as PIPESAFE and ORDER allows National Grid Gas access to important research and development projects that could otherwise be more difficult to fund on an individual basis. This is a leveraged activity that offers extensive networking opportunities with other gas transporters and across the wider industry, and collaboration in these programmes will continue to play a key role in the enduring innovation portfolio. Specific research and development projects within this collaborative programme will address a subset of information or sites with application to all gas transmission/distribution assets.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL6 Large Scale

Geographical Area

The results and knowledge gained from this collaborative programme will be applicable to the whole UK gas high pressure network.

Revenue Allowed for the RIIO Settlement

None.

Indicative Total NIA Project Expenditure

UK Gas Transmission NIA 2014 - £37.6k. UK Gas Distribution NIA 2014 - £37.6k. Total NIA 2014 - £75.2k

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)

This collaborative programme develops and applies techniques for quantifying the risk associated with pipeline assets and AGIs and investigating the effectiveness of a variety of approaches for reducing risk. Collaboration with these companies helps to reduce cost and to learn from the experiences of other pipeline companies and to share best practice. The main benefit of the project is in cost avoidance. The cost of a high pressure pipeline incident could be upwards of £50 million. The high pressure pipeline incident experienced at Ghislenghien in Belgium was hugely costly (many millions), including compensation payments, resource constraints, reputational damage and stricter regulation.

Please provide a calculation of the expected benefits the Solution

N/A - Research

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

The Method is applicable across the gas transmission and distribution networks, both pipelines and above ground assets.

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

Roll out costs vary from no additional costs, where industry guidelines are updated to £100,000s where a licensee may wish to develop a specific tool to embed specific learning within an individual company.

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

Learning will be used to optimize technical policy with applicability to improved asset management. Learning, where appropriate is fed through into Industry standards (IGEM documents for example) which then becomes available as best practice for all relevant operators across the industry.

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 collaborative programme of work sits within the Safety, Reliability, Environmental and Strategic themes under National Grid's Innovation Strategy.

☑ 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