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

Oct 2017

Project Reference Number

NIA_NGGT0121

Project Registration

Project Title

Risk Assessment Methodologies for Pipelines and AGIs 2017

Project Reference Number

NIA_NGGT0121

Project Licensee(s)

National Gas Transmission PLC

Project Start

April 2017

Project Duration

1 year and 1 month

Nominated Project Contact(s)

Steve Potts (NGGT) & Luke Hollis (Cadent Gas)

Project Budget

£131,551.00

Summary

The high-pressure natural gas transmission system is a complex combination of buried pipelines and above-ground installations (AGIs), such as pressure reduction stations, 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.

Nominated Contact Email Address(es)

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Problem Being Solved

The continuous management and improvement of safety risks on gas transmission 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 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 and best practice. Proposed activities for 2017/18 are as follows:

- Hazard and Risk Assessment Methods for Gas Transmission Pipelines
- Data for Failure Frequency Estimation for Use in Risk Analysis
- Hazard and Risk Assessment Methods for Above-Ground Installations
- Parallel Pipelines
- Effectiveness of Safety Measures

Method(s)

The programme elements are listed below and costed by NIA contribution (£k) in the format:

NGGT | Cadent | other JIP Partners

Hazard and Risk Assessment Methods for Gas Transmission Pipelines

20.0 | 20.0 | 45.0

Data for Failure Frequency Estimation for Use in Risk Analysis

8.3 | 8.3 | 26.1

Hazard and Risk Assessment Methods for Above-Ground Installations

13.0 | 13.0 | 48.0

Parallel Pipelines

2.1 | 2.1 | 12.6

Effectiveness of Safety-improving Measures

1.8 | 1.8 | 14.4

Project management/technical services of NIA

4.5 | 4.5 |-

Totals

£49.7k | £49.7k | £146.1k

Scope

The high-pressure natural gas transmission system is a complex combination of buried pipelines and above-ground installations (AGIs), such as pressure reduction stations, 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.

Hazard and Risk Assessment Methods for Gas Transmission Pipelines

The PIPESAFE Joint Industry Project (JIP) provides the tools to assist National Grid and Cadent in discharging their obligations by developing and refining techniques for quantifying the risk associated with pipeline and above ground assets. In the period covered by the current proposal (2017–18), topics being addressed in the PIPESAFE JIP include a review of the evidence for the behaviour of gas jets in a crater (and, in particular, why horizontal releases are not considered credible for below-ground gas pipeline ruptures) and completion of work to implement the new crater fire model developed last year to improve handling of complex failure modes (e.g. pipeline misalignment), by establishing the methodology for the application of the model in fully probabilistic risk assessments. An updated version of PIPESAFE 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 provided.

Specific development topics to support the use of PIPESAFE by National Grid and Cadent include:

- A screening process for risk assessment of IGEM/TD/1 infringements and development of a risk screening tool aligned with National Grid and Cadent's methodology.
- Updates to the methodology to capture learning from recent research on natural landsliding.

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 and Cadent'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: Firstly; Failure Frequency Analysis (FFA) project – gas release incidents for onshore gas transmission pipelines and secondly; AGI Failure Frequency (AGIFF) project – gas release incidents for high pressure gas above-ground installations.

Hazard and Risk Assessment Methods for Above-Ground Installations

The ORDER Joint Industry Project (JIP) involves an international group of gas 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). In the period covered by the current proposal (2017–18), topics being addressed in the ORDER JIP include CFD studies to investigate the overpressures generated by explosions in large enclosures, to guide the development of the confined explosion model in ORDER. An updated version of ORDER 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 provided.

Parallel Pipelines

The Parallel Pipelines Group (PPG) Joint Industry Project produced a tool (PROPHET) for assessing the possibility of interaction between parallel natural gas pipelines in the event of failure. Recommendations were made for further work in a Phase 3 project which commenced in 2016 to address specific aspects including; implementation of a pressure dependent crater model, review of heat loading and response for punctures within a ground crater and implementation of a probabilistic approach. The PPG Phase 3 project will be completed in 2017 and will deliver a new version of the PROPHET tool with an accompanying final report.

Effectiveness of Safety-improving Measures

Underground steel pipelines are subject to a variety of influences that threaten their integrity. Pipeline operators have a variety of physical and non-physical methods available to them to reduce the likelihood of these threats. Phase 3 of the project commenced in 2016 to collate information on the different non-physical measures in use by pipeline operators and identify an appropriate method for assessing the collective effectiveness of 'non-physical' measures. The findings from the survey, literature review and workshop will be described in a report, with recommendations for the next stage of the work to develop methods of quantifying the non-physical measures of interest.

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 and Cadent'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 and Cadent are able to demonstrate to the safety regulator, their customers and the general public, through their safety cases, that their knowledge of gas transmission hazards and risks is at the forefront of current thinking and therefore that their safety cases are credible and realistic. Such collaboration also allows National Grid and Cadent to participate in, and benefit from: the ongoing development of international best practice in risk management and shared learning from incidents.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

Desk based

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL5 Pilot 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

NGGT NIA 2017 £64,692

Cadent NIA cost 2017 £66,001

Total NIA £131,551

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