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 2018

Project Reference Number

NIA_NGGT0133

Project Registration

Project Title

Risk Assessment Methodologies for Pipelines and AGIs 2018

Project Reference Number

NIA_NGGT0133

Project Licensee(s)

National Gas Transmission PLC

Project Start

April 2018

Project Duration

1 year and 1 month

Nominated Project Contact(s)

Steve Potts (NGGT), Luke Hollis (Cadent)

Project Budget

£144,000.00

Summary

The continuous management and improvement of safety risks on gas transmission pipelines and above ground installations (AGIs) requires development of wide ranging models and procedures. The type of event which affects pipelines and assets located on an AGI is of low frequency, but can have extremely high consequences, therefore it requires accurate models to make safety decisions and keep risks as low as reasonably practicable. Because of this challenge, the efficient development of models and procedures has historically been coordinated through joint ventures.

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Problem Being Solved

The continuous management and improvement of safety risks on gas transmission pipelines and above ground installations (AGIs) requires development of wide ranging models and procedures. The type of event which affects pipelines and assets located on an AGI is of low frequency, but can have extremely high consequences, therefore it requires accurate models to make safety decisions and keep risks as low as reasonably practicable. Because of this challenge, the efficient development of models and procedures has historically been coordinated through joint ventures.

Preservation of our participation in these joint venture initiatives offers considerable benefits in terms of the latest thinking and best practice. In 2018, the project partners, National Grid (NG) and Cadent Gas (CG), seek to continue partnership, with the proposed activities 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 various elements for this innovation project are listed below. In the format of topic, title of key tasks (sub-projects), indication of Joint Industry Project (JIP), with associated leverage where possible.

Hazard and Risk Assessment Methods for Gas Transmission Pipelines:
PIPESAFE (JIP) 8:1 leverage.
HAMM Maintenance – Pipelines

Data for Failure Frequency Estimation for Use in Risk Analysis:
FFA Phase 3 (JIP) 10:1 leverages
AGIFF Phase 2 (JIP) 8:1 leverage

Hazard and Risk Assessment Methods for Above-Ground Installations:
ORDER (JIP) 7:1 leverage
HAMM Update for AGIs

Potential for Interaction between Parallel Pipelines:
GMG Phase 2 (JIP).

Effectiveness of Safety-improving Measures:
ESM Phase 4 (JIP).

Scope

The high-pressure national gas transmission system (NTS) is a complex combination of buried pipelines and above-ground installations (AGIs); including 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, which can be due to a range of causes.

Hazard and Risk Assessment Methods for Gas Transmission Pipelines
The PIPESAFE JIP provides the tools to assist NG and CG 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 NG and CG 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. This area of research participation by NG and CG's in two international JIP's 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). Topics continuing to be be 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.

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 4 of the project commences in early 2018.

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 NG and CG needs, and are equally 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, NG and CG are able to demonstrate to the safety regulator, our customers and the general public, through safety cases, that our 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 the project partners 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

This collaborative programme includes a portfolio of joint industry projects (JIPs) concerned with pipeline safety; each with a schedule of deliverables agreed and defined in separate collaboration agreements. National Grid and Cadent's partners in the PIPESAFE Group, ORDER Group and related joint industry collaborations on pipeline safety issues sponsored through this project include, though may not be limited to:ENGIE (France), Fluxys (Belgium), KOGAS (Korea),Statoil (Norway), Open Grid Europe (Germany), Enagas (Spain)
TransCanada PipeLines (Canada), Swissgas (Switzerland) Gasunie (Netherlands), Energinet.dk (Denmark), Tokyo Gas & Osaka Gas (Japan), BP & Cadent (UK).
Project management through DNV GL

Potential for New Learning

Collaborative projects provide great potential for new learning, by tapping into the knowledge and experience of other operators with the same problems. This project supports NG and CG in optimizing the safety of new facilities through appropriate layout and design, and in achieving ongoing improvements in the efficiency and effectiveness of the management of risk associated with AGIs on the high-pressure gas transmission pipeline network. This project also supports the project partners in achieving ongoing improvements in the efficiency and effectiveness of the management of risk associated with high-pressure gas pipelines.

Typically on each JIP the Final Report or a Public Domain Document is made available for distribution to interested parties without restriction. This arrangement depends on the specific project and confidentiality arrangements for that project. The participation agreements for JIPs also make provision for publication of new developments made as part of the collaboration as agreed by participating companies, e.g. presentation of papers at appropriate conferences.

Learning gained from each project influences the standards for gas transmission pipeline risk assessments published by the Institution of Gas Engineers and Managers which are written around the JIP methodologies, with input from National Grid, Cadent Gas, and DNV GL.

Scale of Project

Desk based.

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 research programme will be applicable to across the UK gas network.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

Total NIA Funding: £144,000
NGGT contribution: £72,000
Cadent contribution: £72,000

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 monetarily is realised in cost avoidance. Looking at implications of an incident on a high pressure pipeline, this has the potential cost upwards of £50 million. As a real world example, the Belgium high pressure pipeline experienced an incident in Ghislenghien, that costed in the 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 knowledge gained in this project 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 will vary depending on the specific area of research. From no additional costs, where industry guidelines are updated, to an estimated £100k+ 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.

The aim of this collaborative project is to avoid duplication and share learning with other gas transporters worldwide, thereby avoiding unnecessary duplication on an industry scale.

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 innovation project incorporates multiple joint industry research projects, to form multi-lifecycle deliverables. Some of the projects are well-established, with the current phase of work being focused on completion of innovative solutions where the feasibility was demonstrated in a previous phase. While others are at an early stage of development.

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

This innovation project is not part of “business as usual” scope of work due to the low TRL of the series of join industry projects. NIA funding is appropriate because there is no guarantee that any individual JIP will be successful; the knowledge gained irrespective of success remains beneficial. Collaborative projects carry an increased level of risk, because of the dependence on other parties outside the control of the Network Licensees. This applies, for example, to the availability of pipeline data from other participating companies. NIA support is appropriate because of the increased commercial and technical risks associated with international collaborative projects, which where a JIP succeeds lead to the benefits of shared learning/experience and reduced development costs to customers of all participating networks.

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

By working together to develop the series of JIPs, the participating transmission and distribution networks ensure that repetition and duplication are prevented and all available data and resources can be pooled for the benefit of cost minimisation to customers. Additionally the collection of detailed data on pipelines and installations that underpins the new series JIPs is only possible because of the recent and ongoing implementations of new systems for detailed and efficient data collection for many thousands of kilometers of gas network and many thousands of different and complex gas installations. It was not previously practical to collect this level of detailed information in a consistent way across many different pipeline companies to allow the data to be combined in a single database format.

This project has been approved by a senior member of staff

☑ Yes