

## NIA Project Registration and PEA Document

### Date of Submission

Oct 2021

### Project Reference Number

NIA\_NGGT0172

## Project Registration

### Project Title

Risk Assessment Methodologies for Pipelines and AGIs 2021 - 2026

### Project Reference Number

NIA\_NGGT0172

### Project Licensee(s)

National Gas Transmission PLC

### Project Start

April 2021

### Project Duration

5 years and 0 months

### Nominated Project Contact(s)

Steve Potts (NGGT), Luke Hollis (Cadent Gas)  
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### Project Budget

£783,000.00

## Summary

The continuous management and improvement of safety risks on gas 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.

## Preceding Projects

NIA\_NGGT0007 - Risk Assessment Methodologies for Pipelines and AGI's

NIA\_NGGT0068 - Risk Assessment Methodologies for Pipelines and AGI's 2014

NIA\_NGGT0105 - Risk Assessment Methodologies for Pipelines and AGI's 2016

NIA\_NGGT0121 - Risk Assessment Methodologies for Pipelines and AGIs 2017

NIA\_NGGT0133 - Risk Assessment Methodologies for Pipelines and AGIs 2018

NIA\_NGGT0153 - Risk Assessment Methodologies for Pipelines & AGIs 2019/20

NIA\_NGGT0163 - Risk Assessment Methodologies for Pipelines and AGIs 2020

## 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 gas 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. As the industry faces the challenge of achieving Net Zero, there must be demonstration that the same or better levels of safety can be met when transporting hydrogen. The models and procedures have to be adapted and proven for use in hydrogen networks.

## Method(s)

Preservation of our participation in these joint venture initiatives offers considerable benefits in terms of the latest thinking and best practice. In 2021 - 2026, National Grid and Cadent Gas 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

In RIIO-1 Risk Assessment Methodologies was sanctioned and registered on an annual basis. It is the intention to sanction for the full period of RIIO-2 with an annual review to ensure value with annual progress reports.

## Scope

The high-pressure natural gas transmission and distribution 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 Gas in discharging their obligations by developing and refining techniques for quantifying the risk associated with pipeline and above ground assets. This also includes a hydrogen version of PIPESAFE

### 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.

### 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).

## Ground Movement Threats to Pipelines

The Ground Movement Joint Industry Project (JIP) involves an international group of gas companies collaborating on understanding the effects of ground movement on buried pipelines.

## Effectiveness of Safety-improving Measures (ESM)

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 aims to develop a single fault tree model that quantifies the combined effectiveness of both physical and non-physical protection measures in preventing pipeline damage.

## Hydrogen Transmission Safety Group (HTSG)

The Pipeline Safety Group (PSG) companies have agreed in principle to kick off a new hydrogen group (HTSG – Hydrogen Transmission Safety Group) with an initial piece of work to undertake a review of what is already known in order to adapt the risk assessment methodology for natural gas to hydrogen. The output will include a specification for experiments to provide data on the consequences of HP hydrogen pipeline ruptures.

## 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 Gas 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)

Technical impact – Research project focussing on informing decisions for future projects that could fall into technical, financial and wellbeing-related projects.

## Success Criteria

Through collaboration with other gas transportation companies, National Grid and Cadent Gas 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 Gas 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 National Grid and Cadent Gas 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 and distribution 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

TRL3 Proof of Concept

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

The results and knowledge gained from this collaborative research programme will be applicable across the UK gas network.

Revenue Allowed for the RIIO Settlement

Not applicable to this R&D project

Indicative Total NIA Project Expenditure

National Grid contribution: £78,600 per annum

Cadent Gas contribution: £78,000 per annum

NGGT Total: £393,000

Cadent Total: £390,000

Total = £783,000

## 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:

Research project - The membership project allows an overview and input on a variety of projects which can support the energy system transition. The hydrogen activities within this membership enable National Grid and Cadent to demonstrate continued levels of safety which support the drive to Net Zero.

#### 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

Research therefore N/A

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

The knowledge gained in this project is applicable across the gas transmission, 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 and Cadent Gas' Innovation Strategies.

#### 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

## Data Access Details

Project data will be shared in line with the requirements of the RIIIO-2 NIA Governance, specifically sections 2.13 – 2.16.

### **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 joint 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 kilometres 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