

NIA Project Registration and PEA Document

Date of Submission

Mar 2019

Project Reference Number

NIA_NGGT0137

Project Registration

Project Title

Monitoring of real-time Fugitive Emissions (MORFE)

Project Reference Number

NIA_NGGT0137

Project Licensee(s)

National Gas Transmission PLC

Project Start

March 2019

Project Duration

2 years and 1 month

Nominated Project Contact(s)

Matthew Williams

Project Budget

£628,000.00

Summary

To deliver a meaningful reduction in fugitive emissions these need to be detected and measured in a robust and traceable manner by a well characterised measurement protocol, which is cost effective to implement.

Nominated Contact Email Address(es)

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Problem Being Solved

The Greenhouse Gas Investigation Mechanism (GHGIM) was introduced in the Gas System Operator Incentive Review 2015-18. It required NGGT to undertake activities to improve the understanding of venting, identify ways to increase transparency through accurate measurement of venting and identify ways to deliver long-term carbon benefits through cost effective mitigation of venting within its control.

To extend the GHGIM to deliver a meaningful reduction in fugitive emissions there is a need to be able to detect and measure these gases in a robust and traceable manner by a well characterised measurement protocol, which is cost effective to implement.

This proposal covers work to develop a robust fugitive emissions methodology and to use this as a reference system for classifying the performance of new low-cost sensor schemes to be developed under this project. This should take the technology readiness of the low-cost sensor methods from TRL3 to TRL7.

Method(s)

In addition to the testing protocols and system development, the programme will also develop a facility to test and validate on-site quantitative leak detection and quantitative methods such as: Optical Gas Imaging (OGI) cameras and hi-flow samplers both in the laboratory and in real world conditions on the NTS. This will enable validated methods to be implemented across the NTS and will feed into the European CEN Standardisation process.

We will be undertaking seven [7] clearly defined work packages:

1. Examining engineering solutions to reduce installation costs;
2. Improving modelling of sampling locations to ensure robust monitoring;
3. Developing a Standard Operating Protocol to enable the method to be rolled out across the NTS;
4. Developing and testing low cost sensor schemes to supplement the high accuracy gas analyser;
5. Investigating different real-time sampling strategies to reduce sampling redundancy;
6. Performing measurements at additional sites to demonstrate the improvements;
7. Testing and validating quantitative Optical Gas Imaging and other leak detection methods.

Scope

Under the GHGIM, NGG partnered with NPL to develop a fugitive emission detection and quantification system which it trialed at 2 compressor stations with varying levels of success. For NGG to rollout this system across the NTS it has to ensure that it provides robust results under a wider set of operating conditions. In addition, NGG are required to provide a detailed cost-benefit analysis in their RIIO T2 discussions with Ofgem to fund potential roll out. The monitoring system must give value for money for consumers and meet their requirements.

Additional development and validation of the system is required to demonstrate this robustness. The system is also expensive to install, so more cost-effective solutions need to be found to make the system viable.

Currently the four yearly Leak Detection and Repair (LDR) site surveys are time consuming and do not detect all leaks. The current surveys are restricted to ground level accessible valves and pipework. The use of optical gas imaging (OGI) cameras will help to speed up and improve these surveys if they can be shown to give representative results with a demonstrable measurement uncertainty. OGI has the potential to detect leaks that could be missed under the current LDR methodology.

This proposal covers work to develop the distributed system into a more robust methodology and to use it as a reference system for classifying the performance of new low-cost sensor schemes to be developed under this project. This should take the technology readiness of the methods from TRL3 (experimental proof of concept) to TRL7 (system prototype demonstration in operational environment).

Change Control August 2020:

COVID-19 has caused a programme delay due to site operational restrictions being imposed to protect the welfare of all personnel - which will also incur additional project costs.

The delay has impacted the decommissioning of the monitoring system on one site, and the delivery and trial of the system on another – hence impacting the delivery schedule of the programme.

Comprehensive risk assessments that consider COVID-19 and onsite working has resulted in the requirement for portable welfare facilities to be delivered to site so that NPL do not have to share common welfare facilities with NG staff. This comes with an additional cost impact to the project.

The extension of the project has also resulted in the data sim package that's required to transmit the operational data back to NPL has now lapsed, meaning a new sim plan must be procured in order to deliver the project results.

This change control seeks to reforecast the remaining work packages and the associated work involved and extend the project finish date until end of March 2021. The cost element breakdown is as follows:

New Sim data package (20 sims, 1 year min term(=) = £1000

Portable Welfare Facilities = Up to £4000.

Objective(s)

Develop a robust methodology to monitor fugitive emissions and to use it as a reference system for classifying the performance of new low-cost distributed sensor schemes to be developed under this project.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

This proposal covers work to develop the distributed system into a more robust methodology and to use it as a reference system for classifying the performance of new low-cost sensor schemes to be developed under this project. This should take the technology readiness of the methods from TRL3 to TRL7.

The project will then provide a holistic fugitive emissions monitoring capability and framework for the NTS.

Project Partners and External Funding

Project Partner – National Physical Laboratory (NPL)

External Funding – (nil)

Potential for New Learning

The proposal will also develop a facility to test and validate on-site quantitative leak detection and quantitative methods such as: OGI cameras and hi-flow samplers both in the laboratory and in real world conditions on the NTS. The facility will be of benefit to other

licensees that use OGI for leak detection and will enable validated methods to be implemented across the NTS and will feed into the European CEN Standardisation process.

Scale of Project

The programme will be developing and demonstrating sensors and techniques under laboratory and field conditions.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

All work will be conducted in the UK on the National Transmission System (NTS) assets.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

Total Project Spend: £628,000

Project Eligibility Assessment Part 1

There are slightly differing requirements for RII-1 and RII-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RII-2 / RII-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 RII-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 (RII-1 projects only)

Replacement of current four yearly compressor and terminal fugitive emission survey programme at a cost of £60k per annum.

Gas Transmissions current estimate of annual fugitive emission from leaking ground level accessible valves and pipework determined at fugitive survey is 286 tonnes of methane. This emission represents a controllable emission worth £487k per annum combining the product value and carbon cost of the lost methane (product value £58k plus carbon cost £429k). This lost gas represents a target for reduction.

Alternatively, the cost benefit of the monitoring system could be measured in terms of the total fugitive emission from Gas Transmission's assets which is currently estimated at 4609 tonnes of methane (Ref. Submission to UK National Atmospheric Emissions Inventory; 10th August 2018) and the National Grid Plc agreed carbon price of \$60 a tonne. This emission represents ~£5.3m at the group carbon price and a nominal 5% reduction in Gas Transmissions total fugitive emissions represents a carbon reduction of ~£267k.

Please provide a calculation of the expected benefits the Solution

Research Programme (see commentary above).

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

Potential applicability to all compressor sites, terminals, AGIs and pipeline maintenance activity on the NTS however a deliverable of the project is a "Developing a Standard Operating Protocol to enable the method to be rolled out across the NTS". Within this deliverable an acceptance criteria or suitability of the monitoring system for an installation will be developed.

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

The potential rollout costs are estimated to be between £1.2 million to £3.2 million based on original system developed for GHGIM. If lower cost sensors can be shown to deliver equivalent methane measurement performance to the high capital cost of the methane analyser in the original system this cost will be significantly reduced. NPL to confirm estimated capital cost reduction.

Requirement 3 / 1

Involve Research, Development or Demonstration

A RII-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

The proposal will also develop a facility to test and validate on-site quantitative leak detection and quantitative methods such as optical gas imaging (OGI) cameras and hi-flow samplers both in the laboratory and in real world conditions on the NTS. The facility will be of benefit to other network licensees that wish to consider the use OGI for leak detection and will enable validated methods to be implemented across other gas networks. This work will feed into the European CEN Standardisation process and thus ensure the learning is available across the widest possible spectrum of the gas transmission and distribution industries.

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

The proposed programme addresses NGGT's emissions mitigation 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.

This programme is an extension to the GHGIM (Greenhouse Gas Investigation Mechanism) and as such does not duplicate any previous or existing programmes.

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

Following the conclusion of the Greenhouse Gas Investigation Mechanism (GHGIM) and its introduction into the Gas System Operator Incentive Review 2015-18, there was an understanding that fugitive gas emissions would also be required to be measured and quantified in a structured and auditable manner. Due to the highly complex nature of their manifestation, a clearly defined framework of

innovative techniques and systems need to be evaluated to provide the most appropriate and cost effective solutions. If the effective use of optical gas imaging (OGI) cameras can be proven, this is both innovative and has widespread gas industry applicability.

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

Currently fugitive emissions are monitored under the four yearly Leak Detection and Repair (LDR) site survey protocols. The development of a fugitive gas real-time monitoring framework utilising novel cameras (OGI) and techniques requires a dedicated, clearly defined programme to minimise both financial and technical risks. NGGT is always looking to utilise emerging technologies to improve efficiencies and reduce costs. The current status of OGI as an emerging technology and the risks around its development would make funding this programme outside the NIA framework challenging.

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 development of an optical gas imaging (OGI) real-time based fugitive monitoring system offers considerable potential for all network operators but the initial phases of the system development do carry financial and technical risks. There are significant technical challenges which must be addressed such as camera performance under real site conditions and the development of techniques to provide a holistic fugitive emission budget for a site. The NIA framework offers a robust, open framework for this work to be conducted under and the results will be fully articulated to all stakeholders which will help them implement such technologies cost effectively.

This project has been approved by a senior member of staff

☒ Yes