NIA Project Registration and PEA Document

Date of Submission

Oct 2022

Project Reference Number

NIA_NGGT0198

Project Registration

Project Title

Dynamic Risk Based Patrolling

Project Reference Number

NIA_NGGT0198

Project Licensee(s)

National Gas Transmission PLC

Project Start

October 2022

Project Duration

0 years and 7 months

Nominated Project Contact(s)

Sabia Sadiya, box.GT.innovation@nationalgrid.com

Project Budget

£172,504.00

Summary

As part of our Asset management and maintenance activities, we carry out patrolling activities to identify and mitigate any third-party threats to our network. The transition to hydrogen will require increased maintenance and patrolling, the aim of this project is to identify the high-risk areas of the network and prioritise patrolling activities to allow a more efficient maintenance regime. This will be achieved using a predictive model.

Advanced analytics allows us to optimize the patrolling frequency based on the probability of unannounced third-party works on the assets. It can be further utilized with novel data sources to optimise vegetation, marker posts and all other patrolling activities. Where linked to satellite and other advanced imaging systems it could negate the need for costly patrolling activities.

Nominated Contact Email Address(es)

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Problem Being Solved

National Grid Gas Transmission is responsible for the operation and maintenance of more than 4700 miles of high-pressure pipelines throughout the UK. These pipelines should be patrolled to ensure safety and integrity via various means (on foot, helicopter, car, drones).

The patrols have many goals such as:

● Detect unannounced third party works,

● Check if ongoing works are respecting the applicable regulations,

● Detection of (micro) leaks by observing the vegetation,

● Detect the presence of stored material, not allowed vegetation, damaged signalisation, etc.

As NGGT transition to hydrogen increased patrolling will be required, which is costly and can have environmental impacts (use of helicopters).

The system operators classify their assets based on the pipeline diameter, operating pressures, class location, terrain, expert judgement, or the applicable regulations and adjust the patrolling activities accordingly. However, the patrolling scheduling often remains static with fixed intervals in between the patrols and very few dynamic inputs. As a result, this approach has limitations and is not optimised.

Method(s)

The supplier N-side will configure their mathematical based prediction model, to determine what the probability of near future events on a pipeline are. This requires two types of inputs, static and dynamic. Static inputs include data such as criticality of the pipeline, event history and the type of terrain in which the pipeline is. Dynamic inputs include seasonal data, number of works nearby and any recent events. These will be loaded into the prediction model and the probability of future events will be used to adapt the patrolling frequency.

Measurement Quality Statement

The measurement approach used to meet Data Quality objectives will be through the identification of high calibre project partners who are experts in their given field. The methodology used in this project will be subject to our supplier's own ISO 9001 certified quality assurance regime and the source of data, measurement process and equipment as well as data processing will be clearly documented and verifiable. The measurements, designs and economic assessments will also be clearly documented in the relevant deliverables and final project report and made available for review.

Data Quality Statement (DQS)

The project will be delivered under the NIA framework in line with the agreed Energy Networks Innovation Process document NGGT / NGET internal policies. Data produced as part of this project will be subject to quality assurance to ensure that the information produced with each deliverable is accurate to the best of our knowledge and sources of information are appropriately documented. All deliverables and project outputs will be stored on our internal SharePoint platform ensuring backup and version management. Relevant project documentation and reports will also be made available on the ENA Smarter Networks Portal and dissemination material will be shared with the relevant stakeholders.

Scope

The project will be split into 5 Phased work packages:

Work Package 1: Data requirements

Foreseen duration: September 2022 – October 2022 (2 months)

Objective: During this phase data sources, data requirements and assumptions are to be identified and listed to determine constraints that need to be modelled in the AI tool.

Deliverables:

A. Data set requirements: Collaborative work between National Grid Gas Transmission (hereafter mentioned as NG) and N-SIDE to determine required data sets that need to be incorporated into the model. The supplier and NG will work hand in hand to identify internally and externally available data sets.

B. NTS Zone selection: NG will provide the most relevant region on the NTS to test the prediction model.

C. Data collection and formatting: N-SIDE, together with the support of NG, will summarize the selected data sets and formatting required for the prediction model build phase and NG will collect and pre-process the data to fit the format requirements defined with N-SIDE. NG will besides the data sets itself also provide a minimal written documentation of the business meaning of the different features included in the datasets in case there could be ambiguity. It is expected that the datasets and documentation is provided at the latest 3 weeks before the end of the phase to give N-SIDE enough time to further clean and cross the datasets.

 D. Status Update: An initial kick-off meeting will be held. This will be followed by fortnightly project progress meetings where N-SIDE will present progress made during the month in question.

Work Package 2: Prediction Model Build

Foreseen duration: November to January 2023 (2.5 months)

Objective: During this phase, all data sets identified in phase 1 will be built into the prediction model.

Prerequisites: Phase 1 identified data sets and assumptions utilised to build the prediction model ready for user acceptance

testing. The most important prerequisite of this phase is that NG provides the identified data sets in the right (pre-agreed) format, to avoid delays caused by data cleaning.

Deliverables:

A. Model Build: The supplier will build all data sets and rules into the model ready for testing

 B. User acceptance testing: SME will test the tool, assess the output of the prediction model, and provide feedback for further development

Work Package 3: Test Deployment

 Foreseen duration: Mid-January to Mid-February 2023 (1 month)

Objective: During this phase, SMEs will take part in a challenge and review session to analyse the prediction model outputs and provide feedback for any further improvements/enhancements. N-SIDE will then write a technical report.

 Deliverables: A technical report including:

A. SME Challenge and review (NG)

 B. The Deployment Route: How would this be utilised within the business?

C. A Data Set Review: Is there enough information in the model to make it realistic and how much additional work is required

D. The Model update: Incorporation of updates and feedback identified from SME challenge and review sessions

Work Package 4: Standard reporting

Foreseen duration: Mid-February to Mid-March 2023 (1 month)

 Objective: NIA Reporting

 Deliverables:

 A. Technical Report on the work carried out

B. Technical Summary: N-SIDE will provide the summary within the above-mentioned technical report.

C. Draft Standard update: NG to review the output of the project and identify if any standards need to be updated considering the results (NG/N-SIDE).

D. Closure Report: Depending on the funding mechanism, N-SIDE may need to populate an ENA closure report document using the information provided in the technical report (NG/N-SIDE).

Work Package 5 – Project Management

Foreseen duration: September 2022 – March 2022 (7 months)

Objective(s)

The key objectives for this activity are as follows:

·   Demonstration of a prediction model that can utilise various data sets to optimise patrolling frequencies based on 3rd party risks on the network.

·   Quantify the value of the model in terms of time and cost savings

·   Link project outcomes to further innovation projects looking at 3rd party damage prevention on the network using novel technologies

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

An assessment of distributional impacts (technical, financial and wellbeing related) for this project has been carried out using a bespoke assessment tool, which assesses the project as having a positive, negative or neutral effect on consumers in vulnerable situations. To help inform the assessment, this tool considers the categories of consumers identified in the Priority Services Register. This project has been assessed as having a neutral impact on customers in vulnerable situations. This is because it is a transmission

project.

Success Criteria

The following key criteria need to be met for the project to be considered successful:

·   Study objectives met to time and cost.

·   Demonstration of a prediction model that can utilise various data sets to optimise patrolling frequencies based on 3rd party risks on the network.

·   Quantify the value of the model in terms of time and cost savings.

·   Link project outcomes to further innovation projects looking at 3rd party damage prevention on the network using novel technologies,

Project Partners and External Funding

Gas Network – National Grid Gas Transmission

Supplier - N-Side

No external funding

Potential for New Learning

National Grid Gas Transmission are expecting to utilise the prediction model to identify high-risk regions on the network where patrolling activities can be prioritised. As part of the energy transition from methane to hydrogen, pipelines will require increased patrolling which can be expensive and have environmental consequences if not optimised. Prioritisation of high-risk regions will allow the introduction of novel technologies to help stop damage from third parties. Learning will be shared across the business.

Scale of Project

This project is a demonstration project that will provide greater information and detail in the dynamic risk based patrolling decision-making process. The goal for the tool is to identify high- risk 3rd party interference regions on the NTS to support optimisation of patrolling activities to ensure value to hydrogen gas customers. The demonstration of a functioning predictive model for a region of the NTS will inform the patrolling scheduling activities, this will allow a more efficient patrolling schedule which will be beneficial for the energy transition both from a safety and economical point of view.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

UK

Revenue Allowed for the RIIO Settlement

None – Hydrogen network focused project

Indicative Total NIA Project Expenditure

£172,504.00

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:

For the transition to hydrogen, the NTS will need to ensure hydrogen can be supplied to consumers reliably and safely across the UK. A future hydrogen network will require increased patrolling especially with a growing asset base. A tool is needed to ensure an optimised patrolling schedule is adopted, accounting for high-risk regions of the NTS where more investment is required. This predictive tool will incorporate a wide variety of data inputs, including historical events to provide the most cost-effective solution.

How the Project has potential to benefit consumer in vulnerable situations:

There is a potential indirect benefit to vulnerable consumers as the predictive model will support optimised patrolling planning which will be beneficial in a Hydrogen future as it promotes economic and efficient investment and reduces the risk of third-party asset interferences and potentially damage, therefore reducing cost to the consumer.

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)

RIIO-1 Question N/A

Please provide a calculation of the expected benefits the Solution

N/A

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

In this project the predictive model will be developed based one a chosen region of the NTS incorporating data for that region. This can then be further expanded to include the whole of the NTS and additional data sets may also be incorporated.

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

The predictive model tool could be licenced to National Grid Gas Transmission in order to be repeatedly used for new regions of the NTS as needed. As the tool is software based there would be minimal costs to roll-out this application across the UK. Potential costs, however, could be software licensing, training and any additional regional data inputs that would be sought.

The outcome of this project will inform future rolling costs.

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

The development and use of the predictive model tool will inform of the high-risk regions on the NTS this data can be shared with other network licenses operating in the same region. With the right data parameters, this tool could be applied at both transmission and distribution levels.

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

RIIO-1 Question N/A

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.

There will be no duplication of activities done as part of this programme. Current scheduling activities do not include a mathematical based prediction model to optimise patrolling frequencies.

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

The use of a prediction model to incorporate various data sets which would otherwise be seen as separate data sets, to achieve risk ranking for pipelines is what makes this an innovative project. Data sets include historical events, geographical information, pipeline information, seasonal factors and dynamic parameters such as recent reports of events and recent works requested near the pipeline.

Relevant Foreground IPR

This project and the resultant outcomes/deliverables will conform to the default treatment of IPR as set out under the agreed NIA Governance (where the default requirements address two types of IPR: Background IPR and Foreground IPR).

Data Access Details

Data for this project, and all other projects funded under the Network Innovation Allowance (NIA) funding scheme, can be found or requested in a number of ways:

A request for information (RFI) via the Smarter Networks Portal at https://smarter.energynetworks.org. National Grid Gas Transmission regularly publishes much of the data arising from our innovation projects on the ENA portal, before submitting a RFI check this website.

Via our managed mailbox box.GT.Innovation@nationalgrid.com. Further data can be shared upon request through the innovation mailbox. Each request will be assessed by the GT Innovation Team for its merits and viability.

Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

The project is looking for a solution to optimise the frequency of patrolling activities an activity that will increase with the energy transition from methane to hydrogen, thus can not be funded as BAU at this stage.

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 application and technical challenges around the development of a prediction model requires research into suitable data sets and potential new hydrogen data sets and therefore carries additional exposure to risk – the NIA funding reduces exposure to the risk and enables the early-stage demonstration to occur.

This project has been approved by a senior member of staff

☑ Yes