

NIA Project Registration and PEA Document

Date of Submission

May 2022

Project Reference Number

NIA_NGGT0192

Project Registration

Project Title

New Pipeline AI Route Planning

Project Reference Number

NIA_NGGT0192

Project Licensee(s)

National Gas Transmission PLC

Project Start

June 2022

Project Duration

0 years and 4 months

Nominated Project Contact(s)

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Project Budget

£71,333.00

Summary

As part of Project Union certain areas of the backbone will require new pipeline builds.

There are several factors to consider when routing for new pipelines and traditionally this is a desktop based back and forth exercise that requires a lot of time and resource to investigate different options, usually these are not explored in great detail.

The aim of this project is to utilise an AI based tool or platform to enable the rapid exploration of pipeline routing options for these new pipelines. The benefit of an AI based tool is that the various constraints that need considering can be overlaid in one platform allowing the narrowing down of options which can then be explored in greater detail by specialist teams.

Nominated Contact Email Address(es)

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Problem Being Solved

There are several factors to consider when routing for new pipelines and traditionally this is a desktop based back and forth exercise that requires a lot of time and resource to investigate different options, usually these are not explored in great detail. Spearheaded by Project Union, it is likely that while repurposing of pipeline is the primary option, there will be a case for new hydrogen pipeline routing.

The transition to Net Zero will and is occurring at pace and traditional methods and tools for pipeline routing are cumbersome, inefficient, not cost effective and liability not to capture all the data needed to make accurate fast-paced decisions

Method(s)

The supplier, Continuum, will configure their proprietary software package, Optioneer(TM), to meet National Grid Gas Transmissions technical requirements for new pipeline route planning. The existing technology, Optioneer(TM), uses artificial intelligence to rapidly

generate and examine millions of pipeline routing options in detail against different engineering, environmental/social and cost criteria. This enables the assessment of a wide range of options, in a greater level of detail, early in a project.

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. In this instance WP1 of the project will be critical in determining the required data sets and standards of data which will be incorporated into the AI tool.

Data Quality Statement

The project will ensure that data used is of sufficient quality to deliver project objectives by aligning the hydrogen data sets to current rules and standards for similar routing activity. Robust analysis of this data will be undertaken to ensure the quality of output for the tool. The relevant data and background information will be stored for future access within the National Grid Innovation SharePoint site.

Scope

The project will be split into 4 Phased work packages:

1) Work Package 1 – Data gathering and project space configuration in Optioneer (Duration – 6 weeks)
Lead – Continuum Industries and National Grid

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

Work Package 1 will include:

Workshop 1 via Teams - Kick-off:

- Present the methodology for pipeline routing with Optioneer.
- Present and discuss GIS datasets, design rules and evaluation criteria typically used for a pipeline project in Optioneer.
- Identify NG teams/individuals to input and validate the list of GIS datasets, design rules and construction costs.
- NG to share the location of the test project section and internal documents regarding pipeline build standards.
- Review of NG pipeline build standards Continuum Gathering and processing of GIS data
- Workshop 2 via Teams - Review of environmental constraints
- Workshop 3 via Teams - Review of technical standards /design rules
- Data upload, configuration of input parameters and set up of a project space in Optioneer
- Workshop 4 via Teams - Presentation of a configured project space in Optioneer together with initial corridor options
- Technical report preparation

2) Work Package 2 – Test deployment (Duration – 8 weeks)

Lead – Continuum Industries and National Grid

During this phase all data sets identified in phase 1 will be built into the platform in preparation for the testing phase. A section of the Project Union backbone will be selected to test the AI route planning and SME's will be engaged for challenge and review.

Work Package 2 will include:

- Two training sessions for the NG team members via Teams
- Named members of the NG team receive access to the project space in Optioneer and use the software to identify route options with participation from Continuum engineers.
- Weekly review meetings to provide further training and record feedback from NG
- SME challenge and review (Timelines to be defined by NG)
- Assessment of deployment routes (Timelines to be defined by NG)
- Workshop 5 via Teams to identify gaps in the Optioneer software that would need to be addressed before the tool can be fully utilised on live hydrogen pipeline projects.
- Technical report preparation

3) Work Package 3 – Test Deployment (Duration – 1 month)

Lead – Continuum Industries and National Grid

During this phase the final route will be tested, and final technical and closure reports will be prepared.

Work Package 3 will include:

- Standards & Reporting
- Preparation of a technical report based on the two reports prepared in Phases 1 and 2
- Preparation of a technical summary
- Technical report review by NG
- Review standards and identify if any updates need to be made (NG to confirm timelines)
- Preparation of a closure report (NG to provide timelines)

4) Work Package 4 – Project Management (Duration – 4 months)

Lead – Continuum Industries and National Grid

Objective(s)

The key objectives for this activity are as follows:

Demonstration of a GIS based AI tool that can utilise various data sets to identify potential routes for new pipelines
Quantify the value of the tool in terms of time and cost savings

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

The National Transmission System (NTS) is a key UK infrastructure for the transport of Gas to consumers, including those considered vulnerable. In a scenario where hydrogen replaces methane as a household heat source, it is essential the vulnerable are not excluded by virtue of fuel inaccessibility. In cases where vulnerable consumers already utilise gas, it is likely that in a net zero future the optimum option is to provide a consistent energy solution. The transition to hydrogen within the NTS provides continuity of access to the vulnerable of hydrogen as a replacement to methane, with ongoing benefits of efficiency and economy of scale within a closely regulated environment. This project supports the transition of the NTS to hydrogen which in turn supports the availability of gas to the vulnerable.

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.

AI tool can be utilised for various data sets to identify potential routes for new pipelines.

Project Partners and External Funding

Gas Network – National Grid Gas PLC

Continuum Industries

Potential for New Learning

National Grid Gas Transmission are expecting to utilise new AI technology to learn routing options for new pipeline sections. These new sections of pipeline will be required to enable the safe and reliable repurposing of NTS feeders to enable the Project Union Hydrogen backbone. 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 pipeline routing process and decision-making. The goal for the tool is to identify cost-saving routing options to ensure value to hydrogen gas customers. The demonstration of a functioning AI tool for a section of the Hydrogen Backbone will inform the development Project Union and ultimately inform the new piping strategy for hydrogen.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

United Kingdom

Revenue Allowed for the RIIO Settlement

None – Hydrogen network focused project

Indicative Total NIA Project Expenditure

£71333

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 across the UK. A future hydrogen network may require new routes as the demands upon hydrogen may differ to that of methane. A tool is needed to ensure the best routing solutions are adopted, accounting for a significant volume of information points. This AI tool will incorporate a wider variety of data inputs to provide the most cost-effective solution.

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)

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

The project AI tool will demonstrate a section of 200km of new routing incorporating the data for that region. Once proven within the project via UAT, the AI tool can be utilised across the UK. This will require additional regional data inputs.

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

The AI tool could be licenced to National Grid Gas Transmission in order to be repeatedly used for new routing 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 research and build of the AI tool will inform the strategy for hydrogen pipelines across this UK for the energy transition. 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. There are routing tools presently used but these focus on methane and do not incorporate the methodologies of AI technology.

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 AI software to overlay several constraints, that would otherwise need investigating separately, to achieve rapid pipeline routing option results makes this an innovative project.

Relevant Foreground IPR

The results of the project will enable us to inform the NTS strategy for pipeline routing, especially new hydrogen ready pipelines. The project will develop a new tool for National Grid.

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 project is looking for a solution to enable the transition of existing pipelines to 100% Hydrogen, the current network is licenced to carry methane only.

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 developing a new routing AI tool requires research into 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 testing a potential new pipeline section for Project Union.

This project has been approved by a senior member of staff

Yes