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

Jun 2025

Project Reference Number

NIA2_NESO110

Project Registration

Project Title

FastPress Alpha+

Project Reference Number

NIA2_NESO110

Project Licensee(s)

National Energy System Operator

Project Start

April 2025

Project Duration

0 years and 7 months

Nominated Project Contact(s)

innovation@nationalenergyso.com

Project Budget

£600,000.00

Summary

This project explores the potential use of Artificial Intelligence to inform and improve National Transmission System (NTS) network planning decisions, namely, to optimise the configuration of network assets to ensure sufficient pressure on the NTS. It aims to develop and deploy an AI-based software tool that could allow Gas Network Analysts at NESO to rapidly assess 'Static' day-to-day NTS scenarios, by bulk-solving more standard cases, allowing the prioritisation of less standard instances, and helping with the rapid assessment of different network configurations for more complex scenarios. If successful the developed software tools will also enhance finding start points for solving scenarios, check set limit violations alongside provide recommendations for removing pipes from the NTS.

Nominated Contact Email Address(es)

Innovation@neso.energy

Problem Being Solved

NESO has a licence obligation to deliver and publish Gas Network Planning advice. The Gas Network Analysts at NESO currently use a gas network modelling simulation software (SIMONE) to understand, for a range of supply and demand scenarios, whether gas can be supplied to NTS offtakes from supply locations at obligated pressures, across 24-hour periods.
Network Analysts first run 1) a "static" scenario, assuming an end of day (EOD) flow rate of gas (flat rate), to solve across a given day, then 2) iterate a "transient" study, whereby gas supply & demand flow profiles, together with configurations of assets including flow control valves and multi-junctions, are inputted at more granular intervals. The number of scenarios to be run day-to-day is currently

prohibitive, and a need has been identified to rapidly assess and prioritise these, such that NESO can focus analyst expertise on more complex cases. As identified in the previous phases details can be found here; FastPress | ENA Innovation Portal, these needs would be addressed by developing and deploying new tools to further obtain solutions to various scenarios. These tools would read scenario data, solve and provide a solution through a user interface for easy evaluation.

Method(s)

The project will apply the following methods:
Advance previous tested concepts to produce a usable and working software tool for Gas Network Analysts with user interfaces for ease-of-use.
Complete any outstanding Azure deployment to support multiple analysts performing the Network Analysts using the developed cloud-based tool.
Use the Azure ML tools to deliver a software solution that would be useful to Gas Network Analysts to enhance their analysis using AI models.
Hand-over the developed tool to NESO to trial, test and use for future Gas Network Planning Analysis.

The base scenario solver tool will solve and provide the network base case solution which is an iterative process of solving various instances of the base scenarios thereby saving network analysts time and eliminating the need for analysts to start a new project from scratch, thereby progressing directly to capability analysis using the BSS outputs. The AI-tool will have capability to take data from a balance sheet, import them into Simone and solve a base case scenario using required compression and no limit violations. It will also generate these base case scenarios to create a large database of solved base case solutions.
Furthermore, the limit violations options checker will allow the tool to detect any violations on the network such as pressures, Limit flow and compressor temperature, allowing the analyst to reduce the time spent on auditing solved network scenarios.

Development of the two features from the earlier Alpha phase (NIA2_NGESO077: FastPress | ENA Innovation Portal) (Base Scenario Solver (BSS) and Limit Violation Checker (LVC)) to a pre-production performance level (from a data science viewpoint). Pre-production level performance for these two features is a requirement to develop the subsequent two features (in D2) at PoC level.
Develop two new features explored in earlier Alpha phase to PoC level: Capability Limit Finder (CLF), and Resilience Testing (RT).
Submission of the final report and Beta planning. This would summarise the work undertaking during this Alpha+ phase, and include a plan for how the FastPress tool could be deployed and integrated into NESO's environment and that can feed into a Beta proof of concept testing phase.

In line with the ENA's ENIP document, the risk rating is scored Low.
TRL Steps = 2
Cost = 2 (£600k)
Suppliers = 1 (1 supplier)
Data Assumptions = 1
Total = 6 (Low)

Scope

The project will focus on enhancing the scoped Base Scenario Solver (BSS) tool and developing the Capability Finder by adjusting supply and demand in static scenarios to automatically find the capability of the network, like the Intact Network Capability Analysis process within Gas Network Planning. It will also consider Pipe Removal analysis/works and prepare for pre-productisation, supporting the final tool being developed for Gas Network Analysts by the DD&T team. Progressing from the proof-of-concepts demonstrated in the previous phases, the project will

Deliver a software tool for preforming Gas Network Analysis with various capabilities among others including
Solving base scenarios.
Finding start points for analysts.
Limit violation options checker.
Scoring solutions functionality

Deliver a holistic documentation for using the created tools with links to additional useful resources where possible.

Objective(s)

- Develop and deliver an easy-to-use AI-based tool to enhance day-to-day operational decisions about the NTS through advanced AI modelling techniques.
- Develop two new PoC features; Capability limit finder MVP and the limit violation checker.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

No specific impact on consumers in vulnerable situations.

Success Criteria

Delivery of an AI tool with easy-to-use graphical user interface for Gas Network Analysts to use to enhance the Scenario analysis.
Gas Network Analysts and other stakeholders will use the tool and validate the outputs.

Project Partners and External Funding

Project Partner: Faculty AI
Data to be provided by National Gas Transmission
No external funding

Potential for New Learning

- Learning will be shared internally through regular briefings, user research, solution documentation and presentation of key findings, with NESO. A report detailing the project process and findings will also be shared on the Smarter Networks Portal.
- Improved operational decision-making, by enabling rapid understanding of prior NTS configurations and the historical relationships between inputs and outputs.
- Ability of NTS analysts to run and solve a wider range of future network planning scenarios, unlocking new options to accommodate hydrogen.
- Potential to scale existing use of analytical tools for decision-making, running these in at least a semi-automated manner, identifying new solutions and maximising the value of analyst time.
- Promote wider understanding and adoption of AI solutions across the business, both for application within these projects but also across NESO.
- Learnings for NESO in how best to share, process and maintain data for analysis in a consistent and secure manner.
- Learning will be shared internally through regular briefings, user research, solution documentation and presentation of key findings, with the ultimate objective to hand over any tools produced to NESO.

Scale of Project

The project spans 5 months with one project partner and a project supporter. The scale of the project is already the minimum viable scope to develop a proof-of-concept solution, without which such tool development would not be feasible (and the learning would not take place).

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL6 Large Scale

Geographical Area

Applicable across GB (full NTS)

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£600,000

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:

he project develops new capability to rapidly assess the feasibility of future NTS methane capability requirements, and the potential reconfiguration of the NTS if the role of hydrogen grows. This is critical for wider energy transition scenarios and decarbonisation of hard-to-abate industries (including gas) and supports NESOs cross vector remit. Independent modelling from Arup on behalf of the National Infrastructure Commission indicates at least £46bn expenditure required to transform the GB gas system (NTS + Distribution) for hydrogen. As such, even marginal planning improvements delivered through this study have scope for considerable value

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)

N/A

Please provide a calculation of the expected benefits the Solution

In the lowest estimated cost hydrogen adoption scenario, NIC modelling estimates a total 'baseline' cost of adapting the UK Gas system of £46bn up to 2050 (Arup, 2023), of which: Hydrogen Local Transmission System (LTS) + NTS backbone costs reflect £19bn. Repurposing NTS + Local Transmission System (LTS)infrastructure costs £12bn The remainder associated to customer, industrial and distribution adaptations. This will require critical decisions as to how infrastructure should be both a) built and b) repurposed, which will not be possible without requisite simulation tools. If these 'lowest' costs are to be achieved, this requires a step change in planning capability. Even if work delivered through this project unlocks 0.1% of the investment value (through developing enhanced planning capability), this would represent £31m until 2050 (2023 prices). While it is not feasible to attribute value directly to the simulation tool, its value is best reflected as a share of the investment of which it is a critical enable

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

Solution applicable across the NTS.

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

Following conclusion of this phase, a further Beta/Live Phase would be required to finalise model development (from proof-of-concept to deployable product) and integrate the solution into NESO systems. It is estimated that the cost of this next phase could cost between £0.75-1.5m – these costs will be developed further within the scope of this project

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

All IP and solution code will be handed over to NESO on conclusion of the project, as such all NESO users will be able to take forward the learnings and the solution developed. National Gas would be a further interested stakeholder, who will be able to adopt the learnings directly through their role as project partner and beneficiary of the planning capability that the solution enables. The final report will outline the findings of the project, outlining how machine learning can be applied to the gas planning process, this report will be disseminated on the smarter network's portal.

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

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.

This is the first attempted application of AI to this problem statement, as opposed to physics-based simulations that consider NTS topology and physical gas flows to NTS Offtakes currently in operation. The AI approach will rapidly assess combinations of previously observed inputs and outputs that ‘solve’ NTS scenarios on a given day, detecting patterns that may not otherwise be evaluated by NTS planning analysts; this reflects a vastly different methodology to existing approaches either within NESO or elsewhere.

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 approach and application are novel, using machine learning to identify similar network configurations and supply and demand patterns that can be recommended to analysts as potential solutions to the scenario.
The proposed development of machine learning within an Azure environment for gas network planning is unproven and uses technologies and techniques that are new to NESO. As an innovation project, there is no guarantee of success or of the specific outcome of the project.

Relevant Foreground IPR

Models: Data science codebase, setting out the training and testing of PoC models.
Report: Reporting to cover progress made, models developed and solution outputs
Application: Front end application to visualise model outputs, with the design / functionality tested with end users

Data Access Details

Data for this project and all other projects funded under the Network Innovation Allowance (NIA), Network Innovation Competition (NIC) or the new Strategic Innovation Fund (SIF) can be found or requested in a number of ways:
A request for information via the Smarter Networks Portal at https://smarter.energynetworks.org, to contact select a project and click 'Contact Lead Network'. National Energy System Operator already publishes much of the data arising from our innovation projects here so you may wish to check this website before making an application.
Via our Innovation website at https://www.neso.energy/about/innovation
Via our managed mailbox innovation@nationalenergyso.com
Details on the terms on which such data will be made available by National Energy System Operator can be found on our website: Data Sharing Approach | National Energy System Operator.

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

The use of machine learning within a cloud environment for gas network planning is unproven and untested – which is why this project is still in the Alpha phase. It offers a huge increase in capability to deliver our licence obligations for holistic network planning in an increasingly uncertain energy environment. But the methods and technology need to be tested both on their own and within the NESO environment before they can be considered for implementation into Beta phase and then implemented into business as usual.
The proposed approach delivers new capability for network operations by:

- Proposing new ways to work with and utilise asset data, specifically to develop new approaches to network planning (e.g. pipe removal)
- Providing a way to determine the capability limit of a network that is robust, repeatable and supported by historic data.

As the solution is developed further, it can also bolster long-term planning capability by:
Providing a flexible AI solution for use in network planning decisions - for example, delivering new capability to assess future network configurations that would be required under different hydrogen scenarios.

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 primary innovation risks relate to typical risks inherent to data science projects, together with adoption into Business as Usual:
1: Performance risk - an inherent risk within data science exploration, that the proposed solution may not be able to deliver the required level of functionality. This may be due to data quality or relevance to the problem at hand, or low predictive power of the features contained within it.
2. Adoption risk: In line with this risk, if the solution cannot deliver technical performance, or provide sufficiently interpretable results, it may hinder adoption into business as usual

This project has been approved by a senior member of staff

☑ Yes