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.
Network Licensees must publish the required Project Progress information on the Smarter Networks Portal by 31st July 2014 and each year thereafter. The Network Licensee(s) must publish Project Progress information for each NIA Project that has developed new learning in the preceding relevant year.

NIA Project Close Down Report Document

Date of Submission

Mar 2026

Project Reference Number

NIA2_NESO110

Project Progress

Project Title

FastPress Alpha+

Project Reference Number

NIA2_NESO110

Project Start Date

April 2025

Project Duration

0 years and 7 months

Nominated Project Contact(s)

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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.

Objectives

- 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.

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.

Performance Compared to the Original Project Aims, Objectives and Success Criteria

National Energy System Operator ("NESO") has endeavoured to prepare the published report ("Report") in respect of FastPress Alpha+, NIA2_NESO0110 ("Project") in a manner which is, as far as possible, objective, using information collected and compiled by NESO and its Project partners ("Publishers"). Any intellectual property rights developed in the course of the Project and used in the Report shall be owned by the Publishers (as agreed between NESO and the Project partners).

The Report provided is for information only and viewers of the Report should not place any reliance on any of the contents of this Report including (without limitation) any data, recommendations or conclusions and should take all appropriate steps to verify this information before acting upon it and rely on their own information. None of the Publishers nor its affiliated companies make any representations nor give any warranties or undertakings in relation to the content of the Report in relation to the quality, accuracy, completeness or fitness for purpose of such content. To the fullest extent permitted by law, the Publishers shall not be liable howsoever arising (including negligence) in respect of or in relation to any reliance on information contained in the Report.

WP1 – Base Scenario Solver (BSS) and Limit Violation Checker (LVC) Proof of Concept

The project advanced the BSS to a pre-production level, successfully solving all static test scenarios provided across multiple demand days. It consistently produced valid solutions that met codified operational checks and performed within the same order of magnitude as analyst solve times. Enhancements such as staged solving and multi-licence parallelisation improved performance and reliability. The LVC was fully developed and validated, automating checks for execution success, linepack accuracy, supply–demand balance, and asset-level limit violations. It reproduced specific analyst tools such as the Pressure Cover Calculator and presented violations through a detailed UI, enabling clear diagnostic insight.

Early versions of the Base Scenario Solver attempted to optimise all network settings simultaneously, but this produced slow, inconsistent results; this approach was replaced with the staged-solving method, which significantly improved accuracy and reliability. Multiple hyperparameter configurations were also trialled, with several leading to population collapse or solver stagnation before the team identified stable, high-performing settings.

The Start Point Finder (SPF) was delivered as designed, returning the most similar historic solved scenarios through a cosine-similarity matching method. It enabled analysts and the BSS to initialise solving runs from credible starting configurations. The feature was integrated into the Local Component Demonstrator (LCD), supporting direct interaction and immediate limit checking.

The Solution Scoring Tool (SST) was implemented and improved, producing continuous scenario scores that captured proximity to operational limits. Through quantifying how close a solution was to acceptable limits; it facilitated the algorithms used in the Base Scenario Solver. This enabled consistent performance scoring and comparison between scenarios. It also allowed scoring for soft limits when no hard limits were present.

WP2 - Capability Limit Finder (CLF) Proof of Concept

The CLF was successfully developed to proof-of-concept level, automating flow adjustments and integrating with the BSS to re-solve scenarios where failures occurred. It achieved measurable entry and exit flow increases across all RIIO zones, for several demand levels tested. By returning the highest solved flow and the step at which a scenario failed, it enabled analysts to review network capability boundaries. The project delivered resilience testing features to PoC standard, allowing scenarios to be solved under the assumption that a subset of compressors is unavailable. It demonstrated alternative valid solutions, which gives evidence for the potential further development to support capability analysis under these conditions.

User-centred design work produced improved UI concepts for the future cloud tool, including interfaces for the SPF, LVC, and the Flow Adjustor. Example mock-up dashboards were demonstrated, where analysts would be able to set up and run different scenarios, as well as view the results of scenarios, interactive network maps, and asset-level detail panels. UI workflows went through several redesign cycles after early prototypes did not align with analyst mental models.

A major engineering milestone was achieved: The gas network modelling software SIMONE was installed and executed within Azure Windows Containers, confirming the viability of the planned cloud architecture. Azure DevOps pipelines were configured to build and deploy these containers, removing the primary technical risk to cloud deployment. Remaining potential obstacles such as the migration of the SIMONE licence server were documented and tracked.

WP3 - Final Reporting and Beta Planning

The project delivered a comprehensive Alpha+ report, summarising methods, outcomes, lessons learned, and remaining challenges, this is also available on Smarter Networks portal. A Beta roadmap was produced, detailing future features such as the Transient Scenario Solver, Infrastructure Timeline Optimisation tool, formalised auditing tools, and plans for migration to the current network model. Ownership, governance, risks, and dependencies were also articulated to support NESO decision-making on future project phases.

Performance Compared to the Original Project Aims

The project delivered its intended purpose by demonstrating that automated, AI-driven scenario solving can reliably support Gas Network Planning. It successfully advanced the Base Scenario Solver and Limit Violation Checker to pre-production performance, developed the Capability Limit Finder and Resilience Testing to proof-of-concept, and de-risked cloud deployment, fully aligning with the original problem statement and approved scope.

Performance Compared to the Original Success Criteria

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.

Achievement Status: Achieved

Result: A functional Local Component Demonstrator (LCD) with an intuitive graphical interface was delivered. Analysts were able to load scenarios, trigger solver components, inspect violations via heat-mapped network views, and download modified RDF files. The UI underwent multiple iterations based on analyst feedback, resulting in a demonstrably easier-to-use interface aligned with their workflow. This directly enhanced analysts' ability to assess scenarios faster and more consistently.

Supporting Evidence:

- Delivery of LCD, interactive maps, asset-level tables, scenario configuration pages, and redesigned workflows.
- Solver Components Integration of SPF, LVC, Flow Adjuster and scoring logic into the UI enabled meaningful scenario analysis.
- Analyst testing sessions documented throughout the Alpha+ report confirmed usability improvements.

Performance Compared to the Original Project Objectives

Objective 1: Develop and deliver an easy-to-use AI-based tool to enhance day-to-day operational decisions about the National Transmission System (NTS)through advanced AI modelling techniques.

Status: Met

Delivery Outcome:

The project delivered an AI-enabled toolset with operationally relevant automated scenario-solving capability (BSS, LVC, SPF, SST) and a functional Local Component Demonstrator (LCD). These features enhanced analysts' ability to solve static scenarios, check limits, reuse past settings, and interpret results directly supporting NTS operational decision-making.

Evidence:

BSS, LVC, SPF, SST advanced to pre-production/P0C maturity; automated solving demonstrated across all test scenarios.

LCD delivered with user-testable UI for scenario solving and limit checking.

SIMONE successfully run in Azure Windows Containers, confirming future cloud-based multi-analyst deployment feasibility.

Objective 2: Develop two new PoC features: Capability limit finder MVP and the limit violation checker.

Status: Met

Delivery Outcome: The project delivered a fully automated CLF capable of adjusting flows, integrating with the BSS, solving scenarios, and returning maximum achieved flows. The LVC was completed to a production-ready standard with full operational-limit interpretation, UI visualisation, and asset-level diagnostics.

Evidence:

Capability Limit Finder Demonstrated automated flow increases, dynamic solving, and outputs of both solved and failing scenarios across RIIO zones and demand days.

Limit Violation Checker delivered full limit-checking engine which identified asset-level limit violations, such as flow and pressure compressor limits, and ensuring supply-demand balance.

Objective 3: Deliver a software tool for performing Gas Network Analysis with various capabilities including solving base scenarios, finding start points for analysts, limit violation options checking and scoring solutions functionality.

Status: Met

Delivery Outcome:

All named capabilities were delivered: BSS solved static scenarios; SPF found similar scenarios for effective starting points; LVC checked compliance with operational limits; SST produced comparable solution scores and supported optimisation algorithms.

Evidence:

Baseline Scenario Solver solved all provided static test scenarios consistently and within analyst-comparable timescales.

Start Point Finder returned nearest solved scenarios using cosine similarity; enabled immediate application and LVC checking.

Limit violation checker automated limit validation including linepack, QP (Quality of Product), pressures, temperatures, and flow mismatches.

Solution scoring tool implemented continuous scoring across linepack, supply/demand, compressor use, and envelope proximity.

Objective 4: Deliver a holistic documentation for using the created tools with links to additional useful resources where possible.

Status: Met

Delivery Outcome:

Comprehensive documentation was provided across the Alpha+ final report, UI designs, workflow descriptions and user-facing demonstrator outputs.

Evidence:

Detailed user-tested UI prototypes, scenario-submission flows, map layers, asset views, and demonstrator outputs.

Full Alpha+ report prepared, including technical explanation, methods, performance evidence, risks, benefits, and Beta plan.

Objective 5: Submission of the final report and Beta planning.

Status: Met

Delivery Outcome:

A full Alpha+ report was completed, summarising all work packages, results, engineering progress, and user insights. A detailed Beta roadmap was produced, including new features (Transient Solver, Infrastructure Timeline Optimisation, Auditing), governance structure, risk management, and transition requirements.

Evidence: Alpha+ report provided a first version Beta plan with, risks, dependencies, benefits, and ownership requirements for discussion and refinement with NESO.

Additional Delivery Context

Several cross-cutting and enabling activities significantly strengthened delivery, even though they were not explicit PEA objectives. A major contributor was the iterative user-centred design process, which involved continuous engagement with Gas Network Analysts. This work surfaced subtle operational requirements, ensured solver behaviour aligned with analyst expectations, and improved the interpretability of automated outputs, which directly increased the tool usability and credibility.

Required Modifications to the Planned Approach During the Course of the Project

Shift from planned cloud execution to local demonstrator use

Full cloud execution, planned in the PEA, was not feasible within the project timelines due to IT migration of NESO systems as part of NESO's separation from National Grid. The team therefore shifted to delivering a Local Component Demonstrator (LCD) to enable analyst testing and validation without cloud infrastructure dependency.

Refinement of solver strategies (staged solving and hyperparameter work)

During delivery, it became clear that the original solving approach was insufficient for consistent performance across demand days. The team introduced staged solving, compressor-initialisation strategies, and deeper hyperparameter optimisation, representing necessary modifications to achieve pre-production performance.

Adjustments to capability-analysis approach

Exit capability analysis under minimum-supply assumptions proved more challenging than expected, particularly at high levels of demand. To maintain progress, the team prioritised the automation of entry capability analysis. The exit capability was still demonstrated to proof-of-concept level, but did not match the outputs of analysts across all scenarios.

Additional UX and workflow redesign

User feedback revealed that initial workflow designs did not fully align with analyst processes. The team expanded UX work beyond the initial plan, iterating on scenario-submission flows, results pages, and data-visualisation elements.

Lessons Learnt for Future Projects

- Early and continuous user engagement is essential. Iterative collaboration with analysts surfaced hidden requirements, corrected assumptions, and ensured the tool aligned with real workflows.
- Solver optimisation requires more time than expected. Achieving reliable performance demanded significant tuning of hyperparameters, solving strategies, and compressor configurations.
- Cloud deployment with legacy systems brings complexity. Running SIMONE in Azure Windows Containers required deeper engineering and risk-mitigation work than originally planned.
- Clear definition of operational assumptions is critical. Validating pressure cover logic, supply/demand thresholds, and limit definitions early prevented mis-alignment later.
- User-centred design is a core, not auxiliary, workstream. Multiple UX iterations were required to deliver an intuitive interface which could be well-used by an analysts.
- Hands-on demonstration of tools increases the usability. Having analysts validate the Local Component Demonstrator enabled practical feedback to help improve the tool.

Note: The following sections are only required for those projects which have been completed since 1st April 2013, or since the previous Project Progress information was reported.

The Outcomes of the Project

The FastPress Alpha+ project successfully demonstrated the feasibility of automating key elements of Gas Network Planning analysis, meeting or exceeding all core PEA objectives. The project advanced the Base Scenario Solver (BSS) and Limit Violation Checker (LVC) to near-production level, developed the Capability Limit Finder (CLF) and Resilience Testing (RT) to proof-of-concept, and delivered a Local Component Demonstrator (LCD) enabling analysts to interact directly with solver and validation features. These outcomes provided strong evidence that automated scenario solving can materially improve analysis speed, consistency, and scalability across RIIO zones and demand days.

The project also removed the key technical risk for cloud deployment by successfully running SIMONE in an Azure Windows Container, establishing a viable architecture for future scaling and multi-analyst use. Extensive user-experience work and operational-assumption validation ensured that the algorithmic outputs remained aligned with real analyst workflows and system rules. Collectively, these achievements demonstrate clear potential for automation to enhance NESO's capability to deliver robust, repeatable network assessments and to reduce manual workload.

Data Access

Details on how network or consumption data arising in the course of NIA funded projects can be requested by interested parties, and the terms on which such data will be made available by NESO can be found in our publicly available "[Data sharing policy related to NIA projects (and formerly NIC)]" and [Innovation | National Energy System Operator.]

National Energy System Operator already publishes much of the data arising from our NIA projects at www.smarternetworks.org. You may wish to check this website before making an application under this policy, in case the data which you are seeking has already been published.

Foreground IPR

Base Scenario Solver (BSS) – genetic-algorithm-based automated solving engine.

Limit Violation Checker (LVC) – automated operational-limit validation logic and asset-level diagnostics.

Start Point Finder (SPF) – similarity-based scenario-matching model.

Solution Scoring Tool (SST) – continuous scoring framework for evaluating scenario quality.

Capability Limit Finder (CLF) – automated entry/exit capability analysis tool integrating flow adjustment and solver components.

Resilience Testing module – tool for solving scenarios under compressor unavailability constraints.

Flow Adjustment Tools – automated demand and supply flow adjusters and flow-step recommender logic.

Alpha+ Final Report – detailed record of methods, results, learnings, and future roadmap published on Smarter Networks Portal.

Planned Implementation

Building on the strong Alpha+ results, NESO intends to submit a Strategic Innovation Fund (SIF) Beta application in February 2026. This will progress the solution into a deployable, production ready tool and include development of: Transient Scenario Solver, Infrastructure Timeline Optimisation and a full cloudhosted deployment, and some formalised auditing and governance components. The outcomes of Alpha+ provide the required evidence base, risk mitigation, and technical foundations to justify and support a SIF Beta proposal.-ready tool and include development of:-hosted deployment.

Net Benefit Statement

Knowledge Benefits

What new knowledge, insights or learning has this project generated?

The project has generated new methods, evidence, learning and skills for automated gas network analysis.

It has delivered:

- New methods, evidence, learning and skills for automated gas network analysis.
- Increased readiness and confidence in adopting AI enabled tools.
- Enhanced organisational maturity for cloud-based modelling.
- Better understanding of capability exploration methods

What impacts has this knowledge had, or is expected to have, beyond the project?

The project:

- Allows NESO to automatically solve static scenarios, check limits, recommend flows and test resilience with far less manual effort.
- Enables entry/exit capability analysis to be partly automated and run more consistently across RIIO zones.
- Enables network capability to be explored under some compressor unavailability scenarios, to proof-of-concept level.
- Enables expanded scenario coverage and broader, earlier identification of constraints.

How will this learning be scaled and disseminated (consider internal and external activities)?

Learning from the project will be shared internally through analyst briefings, cross-team knowledge sessions, and the circulation of technical documentation, ensuring teams across NESO can apply the insights in future work. The Local Component Demonstrator will continue to be used to build analyst capability and support adoption ahead of the Beta phase. Externally, key findings will be published on the Smarter Networks Portal and incorporated into the SIF Beta submission, helping inform sector-wide innovation and future planning. This learning enables NESO to automate processes that previously required extensive manual effort and provides a validated foundation for scaling the solution in Beta.

As a result of this project, what can be done now that was not possible before?

NESO can now:

- Automatically solve static scenarios.
- Check limits and recommend flows with far less manual effort.
- Run more scenarios, more frequently.
- Solve large scenario volumes unattended (overnight/parallel).
- Deploy modelling capability in Azure Windows Containers with CI/CD pipelines and scalable architecture design.

Social Benefits

What social benefits has this project delivered or enabled?

The project has delivered:

- Improved transparency and quality of network assessment.
- Improved ability to anticipate resilience risks and system vulnerabilities.
- Improved system resilience and reduced likelihood of reactive interventions.

Who has benefited (or could benefit) and how?
Analysts benefit through:

- Reduced routine manual workload.
- Ability to interact with automated tools directly, validate outputs, and understand solver behaviour.

The wider system benefits through:

- Improved system resilience.
- Earlier identification of constraints.

Environmental Benefits

What environmental benefits has this project delivered or enabled?

The project has:

- Supported better evidence for hydrogen transition and net zero planning.
- Supported robust decisions on asset use and repurposing.

How has the project supported better environmental decision-making or outcomes?

It enables:

- Expanded scenario coverage.
- Broader and earlier identification of constraints.

Financial and operational benefits

What financial or operational benefits has this project delivered or enabled?

The project has delivered:

- Significant time savings.
- Improved analysis consistency.
- Efficiency gains and reduced effort.
- Scalable cost benefits over time.
- Future scalability for high volume, overnight, or parallel scenario solving.

Other Comments

The Project outcomes and results contain confidential information and intellectual property rights that cannot be disclosed in this

Standards Documents