

NIA Project Registration and PEA Document

Date of Submission

Oct 2026

Project Reference Number

NIA3_NESO010

Project Registration

Project Title

Volta: Advanced Scheduling Advisor 2

Project Reference Number

NIA3_NESO010

Project Licensee(s)

National Energy System Operator

Project Start

October 2026

Project Duration

0 years and 7 months

Nominated Project Contact(s)

Innovation@neso.energy

Project Budget

£1,500,000.00

Summary

The project objective is to develop and validate the Advanced Scheduling Advisor PoC (Proof of Concept) for scheduling decision support using genetic algorithm optimisation. Progressing the Volta ASA1 (NIA2_NESO109) solution delivered in December 2025, this project aims to move from the synthetic abstractions of Phase 1 to a functional PoC. The focus is on validating the tool's logic and results for credibility and alignment to data realities, furthering high impact innovation features, and upgrading infrastructure, engineering and algorithmic speed to robust PoC levels. The project will build on ASA1 using historic operational data, refined optimisation logic, speed improvements, new operational flexibility options and SME testing. Expected outcomes are improved operator insight and scheduling efficiency.

Preceding Projects

NIA2_NESO109 - Volta – Advanced Scheduling Adviser

Third Party Collaborators

Faculty AI

Nominated Contact Email Address(es)

Innovation@neso.energy

Problem Being Solved

In the control room, Control Engineers in the strategy team currently manually revise a system operational plan to ensure NESO can operate an economic and secure system for each cardinal point throughout the day. Each system operating plan is produced as a snapshot of each cardinal point. Although these target the most challenging periods of the day, they may not cover the entire scheduling horizon or all settlement periods as an overall system solution. The current processes are highly manual, with the operators' current tools providing limited decision support. As the number of BMUs (Balancing Mechanism Units) on the system increases, it will become increasingly challenging for operators to solve this manually and economically.

The proposed project will build on the outputs from the ASA1 project (Advanced Scheduling Advisor), which delivered a POC scheduling decision support tool. The tool design uses genetic algorithms to offer decision support to ensure energy balancing and reserve requirements are met across all settlement periods.

Method(s)

Method Volta: Advanced Scheduling Advisor 2 will build on the Phase 1 prototype by maturing the tool from a simplified, synthetic-data proof of concept into a validated scheduling advisory capability using representative NESO operational data. The project will be delivered through structured work packages covering requirements refinement, data integration, algorithm enhancement, testing with SMEs, validation against operational scenarios, and preparation for future productionisation. The work will use agile delivery, regular SME review, and evidence-based validation to ensure the tool is technically robust, usable, and aligned with operational decision-making needs.

TRLs : The current solution is assessed at approximately TRL 4–5, having demonstrated core functionality in a controlled environment using synthetic data and simplified assumptions. The project aims to progress the capability to TRL 6, demonstrating a validated prototype in a relevant operational environment using realistic data, with evidence to support future business adoption and productionisation.

This project will be delivered through the following Work Packages (WP):

WP1:

Demo of optimiser results based on updates to sync and desync logic:

This demo includes multiple sync / desync times and times outside the optimisation window, making the optimiser more aligned to real-world practices and ensuring a more robust set of suggested solutions. -

PoC robustness: Allows units to be used more than once during an optimisation period (to align to realistic operation) MEL/MIL (Maximum Export/Import Limit) engineering adjustments to be made, making the tool more realistic / robust to align to real-world balancing options. Ensure core calculations are exactly aligned to SPICE and produce mathematically identical interim outputs. This step will be focused on ensuring that baseline parameters - such as EMX/EMI, EFCM/EMCM, and initial BMU generation profiles (i.e. BMU / system understanding on which solutions will be built) - are exactly the same as SPICE. Code will potentially be developed within NESO.AI, in python, aligned with relevant coding best practices.

WP2:

Demo of optimiser results (using historical, rather than synthetic data)

This demo provides updated results based on real data (i.e. without abstractions); using historical actual data increases the accuracy of the optimiser results, making the results more trustworthy, credible, and robust.

Using real historic data instead of synthetic data, removing abstractions and making it comparable to Control Room decision-making.

Validation & Credibility: The algorithm has proved and validated calculation logic based on real data. The optimiser would create credible and robust solutions (i.e. BMU suggestions) that solve the system pinch points. Given the same baseline and same data, these results will be compared to a historical baseline for SME validation and benefit quantification.

WP3:

Code walkthrough and demonstration

Provides a recorded presentation to NESO, enabling the sharing of knowledge and best practices in terms of updating and managing the codebase.

WP4:

Final Report (detailing the work conducted and next steps)

Outlines final results in a detailed way, as well as the key suggested next steps needed to support NESO's intake process and deploy the tool to put it into the hands of users.

WP5:

NIA Completion report

Produce the Closure report for upload to the Smarter Networks online portal in order to showcase the outcomes of the NESO project funded through the NIA (Network Innovation Allowance) mechanism.

Measurement Quality Statement

The baseline for the accuracy of the scheduling plans is the System Operating Plan (SOP) documents generated at any point in time of the historical period being considered. This reflects the current methodology used by ENCC (Electricity National Control Centre).. The SOP documents will be compared to the ASA tool scheduling plans that cover the Cardinal Point minute addressed by the SOP. The NESO SMEs will define which SOP documents (i.e. which lead time) and scheduling plans on a case-by-case basis during testing depending on the scenarios being validated.

In line with the ENA's ENIP document, the risk rating is scored 6.

TRL Steps = 1 (2 TRL Steps)

Cost = 2 (£1.5m)

Suppliers = 1 (1 supplier)

Data Assumptions = 2

Total = 6 (Low)

Scope

The scope of the project includes:

- > Optimiser logic updates
- > Removal of final abstractions
- > Tech enablers and speed improvements
- > Algorithm improvement
- > Validation of the product

The deliverables are:

- > D1: Demo 1: optimiser results based on updates to sync and desync logic
- > D2: Demo 2: optimiser results based on updates CCGT (Combined-Cycle Gas Turbine) configurations and engineering adjustments
- > D3: Demo 3: optimiser results based on real data (i.e. using historical, rather than synthetic data)
- > D4: Code walkthrough and demonstration (single recorded presentation to NESO)
- > D5: Final Report (detailing the work conducted and next steps)
- > D6: Demo 4 (final) and wrap-up presentation (including new algorithmic and speed improvements)

The following points are out of scope:

- > Deployment and Integration: Work to deploy solution or port it to OBP (Open Balancing Platform). Integration or operational embedding with OBP including updating front end graphing framework or database schema framework is beyond the scope of this innovation project.
- > Data Scope: Ingestion of or updating with live data. Functionality will be refined on historical data.
- > Model Objective: Model supporting variations to scheduling strategy beyond optimising cost (e.g. carbon, additional reserve/resilience, etc.). SMEs have confirmed that, apart from security of supply, cost is their only optimisation objective. To be fully comparable with historical operating plans, cost should be the only optimisation objective for this phase. Other objectives can be added in future phases but subsequent optimisation results will require additional evaluation.
- > Tool Functionality: Support for actions beyond creating SOPs for balancing (e.g. assigning network constraint groups, trading actions).

Objective(s)

The objectives of this project are to:

- > Further develop and validate the Advanced Scheduling Advisor PoC, building on learning from ASA1, ready for hand over to the business.
- > Improve scheduling decision-support by using more realistic operational data and reducing reliance on synthetic assumptions.
- > Enhance the optimisation logic, including genetic algorithm capability, to assess feasible scheduling options and trade-offs.
- > Improve tool performance and processing speed for future productionisation.

- >Test and validate outputs with Control Room/Operations SMEs to build confidence in operational usefulness.
- >Demonstrate the potential for improved scheduling efficiency and balancing cost reductions.
- >Produce clear recommendations, evidence and learning to support future business adoption
- >Improve operator insights, scheduling efficiency, “what-if” capability and provide evidence of potential balancing cost reductions.

Consumer Vulnerability Impact Assessment

This project has been assessed as having a neutral impact on customers in vulnerable situations because the improvements are on the automation of part of the scheduling process supporting the Control Room operators.

Success Criteria

Headline success criteria

- >The optimiser generates time-coupled scheduling plans at minute-by-minute granularity over a 24-hour horizon, solving across all time frames without violating modelled constraints, including system requirements.
- >Core calculations are validated against SPICE and produce similar interim outputs for scenarios tested.
- >Using real historical data, ASA plans are compared with the System Operating Plans (SOPs) produced by the Control Room for the same cardinal points and input data across scenarios selected by NESO SMEs, and the SMEs confirm the plans are credible and resolve the system pinch points.
- >The costs of the ASA plans are reported against the selected SOPs, providing a measured basis for the project’s benefits case.
- >Each plan explains the overall plan and why individual units were selected, including network and constraint reasons.
- >The tool can re-solve within a 10-minute market refresh interval, and Demo 4 shows improved solution quality and run-time compared with the start of the project.
- >Documented, modular Python code (PEP8 compliant) and a recorded code walkthrough are handed over to NESO, and the final report and first draft of the NIA closure report are delivered.

Project Partners and External Funding

Faculty AI, no external funding

Potential for New Learning

The efficiency of the Genetic algorithm (Evolutionary Computing) approach will be validated across challenging scheduling scenarios in the complex GB market. If proven successful, this approach could represent a viable alternative to the MILP (Mixed Integer Linear Programming) which is currently widely utilised by System Operators globally.

Scale of Project

The project will be delivered over 24 weeks progressing from alignment on input data through optimiser and speed improvements to validation of the final product.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL6 Large Scale

Geographical Area

The project will be based upon the GB National Electricity Transmission System (NETS).

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

Project spent broken down by work package:

M1 - completion of D1 (outline view of technical application workflow) : £345,729

M2 - completion of D2 (1st demo with inclusion of updates to sync/desync logic) : £475,377

M3 - D3 (2nd demo with inclusion of historical data) : £504,188

M4 - completion of D4 (code handover), D5 (code walk-through), : £115,243
and D6 (final report)

Total estimated project cost £1.5 million

The costs presented by work package reflect the direct project delivery activities. In accordance with the NIA Governance and Licence Condition requirements (including the provision for up to 25% of project costs for internal expenditure), the total reported project cost may differ from the sum of work package costs outlined above. All costs are reported to Ofgem in full through formal regulatory reporting at the end of each financial year.

Project Eligibility Assessment Part 1

Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations

Please answer **at least one** of the following:

How the Project has the potential to facilitate the energy system transition:

The ASA tool will help NESO operate a more complex, renewable-led electricity system by using optimisation and AI to improve day-ahead scheduling. By enabling better use of flexible resources including renewables and storage, the ASA tool is intended to improve system efficiency as asset numbers grow, and support the transition to a cleaner, more flexible electricity system.

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

n/a

Please provide a calculation and/or description of the expected benefits of the solution

Improved scheduling has the potential to reduce balancing costs and deliver better consumer value. While the scale of benefit cannot yet be quantified with confidence and will only be understood through testing and validation, even small improvements in scheduling efficiency could result in material cost savings when applied across system operations. The project will establish the evidence base required to assess and quantify these benefits in future.

A high-level financial assessment on the expected benefits provided by the ASA tool is between circa £300M to £800M in annual consumer value. This is calculated assuming a 5-15% efficiency gain on an average annual balancing costs of £5.5 billion between 2028 and 2035, in line with the holistic transition projection.

1. What is the expected benefit delivered directly by THIS PROJECT?

1a.Short outcome statement (clear and specific)

Improved operator insight, better scheduling efficiency, stronger "what-if" capability and evidence of potential balancing cost reductions.

Moreover, the scope for the Volta ASA tool is to enhance grid resilience by identifying and resolving pinch points in an automated, explainable, and auditable way.

One of the goals is to remove all of the abstractions used in ASA1 to ensure that the tool is validated, credible and operationally robust.

1b. Who will benefit from this project and in what way?

The direct beneficiary is the Strategy team in the NESO Control Room, whose members will be supported by the ASA tool automating parts of the current process and providing plans with high frequency of generation to capture the latest data changes and a higher temporal granularity while benefiting from a refined optimiser logic and new features.

By extension, the ASA tool is expected to support the NESO Control Room operators in their continuous improvement of the efficiency of the balancing operations both from the security and from the economic standpoint.

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

The method might not be directly replicable across GB due to the uniqueness of the NESO function and the breadth and depth of its scheduling operations on the GB HV network.

Nonetheless, evidence of the effectiveness of the genetic algorithm in this domain and on the expected improvements in performance could be beneficial for other Network Licensees and market participants and could potentially be utilised for their operations, i.e. in flexibility functions for DSOs and network planning for TOs.

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

From the NESO perspective, is not feasible to estimate the cost and the scope of the adoption of similar solutions and methodologies across GB.

The scale of benefit cannot yet be quantified with confidence and will only be understood through testing and validation.

Requirement 3 / 1

Involve Research, Development or Demonstration

Projects 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

Involve Research, Development or Demonstration - Please select all that apply

- ☒ 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 method might not be directly replicable across GB due to the uniqueness of the NESO function and the breadth and depth of its scheduling operations on the GB High Voltage network.

Nonetheless, evidence on the effectiveness of the genetic algorithm in this domain and on the expected improvements in performance could be beneficial for other Network Licensees and market participants and could potentially be utilised for their operations, i.e. in flexibility functions for DSOs and network planning for TOs.

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. Networks must explicitly mention similar projects that they have considered and how these differ.

Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

Currently, we are not aware of similar products being deployed in the energy domain. This project builds directly on the earlier Advanced Scheduling Advisor (ASA1) project NIA2_NESO109, which established the initial proof of concept, tool design and underlying approach using synthetic data and simplified assumptions. Rather than replicating previous work, ASA2 focuses on validating and maturing the existing capability through the use of representative operational data, enhanced optimisation logic, improved performance and testing with operational SMEs.

The project has been designed to address identified gaps from ASA1, specifically the need to demonstrate the credibility and operational relevance of the approach in a more realistic environment. Activities are therefore focused on progressing the solution from an early-stage proof of concept towards a validated capability that can inform future productionisation decisions.

The project has also been aligned with wider Volta and Open Balancing Platform (OBP) activities to maximise synergies and avoid overlap with ongoing business initiatives. The optimisation capability is being developed to complement existing scheduling transformation activities rather than duplicate them, with learning intended to support future operational development.

By focusing on validation, operational testing and evidence generation, the project will build on existing knowledge and provide new insights on the applicability of genetic algorithm optimisation for scheduling challenges, ensuring innovation funding is used to address remaining uncertainties rather than repeat completed work.

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

This tool will provide a leading-edge decision support capability for scheduling operators, designed around NESO's operational requirements. The ASA tool is at the forefront of optimisation in GB scheduling timeframes, with the potential to support operators in producing a day-ahead system operating plan that is solved for every settlement period of the day. If successful, this could improve both system security and operational efficiency by giving operators stronger insight into feasible scheduling options.

The approach is novel because it explores the use of genetic algorithms in an operational scheduling context, which remains unvalidated at this stage. While ASA1 has helped de-risk some aspects of the concept, the complete approach has not yet been tested without simplifications; therefore, there remains a risk that the tool may not perform as expected when applied to more realistic operational conditions.

Relevant Foreground IPR

The Foreground IPR is expected to include:

- >D1: Technical application workflow documentation.
- >D2: Enhanced Advanced Scheduling Advisor Proof of Concept (PoC) with updated sync/desync logic.
- >D3: Enhanced PoC validated using historical operational data.
- >D4: Code handover materials.
- >D5: Code walkthrough and knowledge transfer materials.
- >D6: Final report, including findings, recommendations and lessons learned.

This Foreground IPR will build on existing Background IPR from ASA1, including the original proof of concept, optimisation methodologies, software code and associated know-how, which may be required to fully utilise or further develop the outputs of ASA2.

Data Access Details

Data for this project and all other projects funded under the Network Innovation Allowance (NIA), or Strategic Innovation Fund (SIF) can

be found or requested in a number of ways:

1. 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.
2. Via our Innovation website at <https://www.neso.energy/about/innovation>
3. Via our managed mailbox innovation@neso.energy

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 a part of it's business and usual activities

The project would not be funded through business-as-usual activities because it is seeking to validate an innovative and unproven approach to operational scheduling using genetic algorithm optimisation. The project is focused on developing and testing a proof of concept, with uncertainty around the effectiveness of the methodology, its operational applicability and the benefits that could be realised.

The project will generate evidence on whether the approach can provide credible scheduling recommendations using representative operational data and support future decisions on potential productionisation. Innovation funding is therefore appropriate to de-risk the concept, validate the approach and generate learning before any future business-as-usual investment is considered.

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 project can only be undertaken with NIA support because it involves significant technical and delivery risk that would not normally be funded through business-as-usual activities. The project is seeking to validate the use of genetic algorithm optimisation for complex operational scheduling, and it remains uncertain whether the approach will perform effectively in a realistic operational environment using representative historical data.

The project is designed to address key technical risks, including the ability of the optimisation approach to produce credible scheduling recommendations, accurately model operational constraints, and operate effectively at the scale and complexity required for NESO scheduling activities. There are also delivery risks associated with integrating and validating historic operational data and demonstrating meaningful improvements over existing manual scheduling processes.

The project will generate the evidence, learning and operational validation required to determine whether the approach is suitable for future productionisation. NIA funding is therefore necessary to de-risk the concept, test its practical applicability and provide an evidence base for future investment decisions before any business-as-usual deployment could be considered.

This project has been approved by a senior member of staff

☒ Yes