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_NESO109

Project Registration

Project Title

Volta – Advanced Scheduling Adviser

Project Reference Number

NIA2_NESO109

Project Licensee(s)

National Energy System Operator

Project Start

May 2025

Project Duration

0 years and 10 months

Nominated Project Contact(s)

Innovation@neso.energy

Project Budget

£1,000,000.00

Summary

The Volta programme is aimed at developing new tools for the control room to include novel technologies that will advance the capability in the Electricity National Control Centre (ENCC).

NESO's Control Room Energy Team currently schedules generating units (via balancing or capacity market) at day-ahead and up to 4-hours ahead timescales, based on a heavily manual and iterative (47-step) analysis process of supply and demand (via the margin analysis curve).

This project will investigate whether an Advanced Scheduling Advisor (ASA) AI solution can be developed to recommend and test scenarios for scheduling of generating units from day-ahead up to 4 hours ahead. The project will be delivered in two parts, firstly comprising a design and development roadmap for a scheduler, and secondly, developing the PoC for deployment.

Preceding Projects

NIA2_NESO106 - Volta – Qualitative Benchmarking and Impact Analysis for Future Dispatching Tools and Capabilities

NIA2_NESO105 - Volta: Real Time Prediction

NIA2_NGESO041 - Model-driven Strategy for Balancing Optimisation (MSBO)

Third Party Collaborators

Faculty AI

Nominated Contact Email Address(es)

box.so.innovation@nationalgrid.com

Problem Being Solved

- The Secure Constrained Economic Dispatch (SCED) scheduling process is currently predominantly manual (47 steps) and time-consuming, requiring users to input data from multiple sources and relying heavily on domain-specific expertise.
- The rapid increase in renewable generating units is escalating the complexity, number of scheduling iterations, and risk to supply security, making it increasingly difficult to select optimal unit combinations.
- This leads to more intraday balancing actions, increasing both the cost and complexity of system balancing (balancing costs increased from ~£3bn in 20221/22 to a peak of £4.1bn in 2022/23 and are expected to increase over the next few years, source: https://www.neso.energy/document/318661/download). There are also challenges in maximising the effective use of new generating units in a way that supports SCED.

Method(s)

This project will take a work-package based approach and will comprise two phases for the initial phases, which will inform further work, defining it further as the project progresses. The first phase will be a development phase and will investigate the work that will be carried out in the next phase, which will be a proof-of-concept (PoC).
The discovery phase will look into the data, tools and processes that would need to be implemented to improve the current process, understand the work that will need to be done in the PoC, undertake a technical assessment for the work that will be done, provide architectural design input for the PoC, and define the business case assessment criteria for the outputs of the next phase of the project. It will comprise of the following activities:

WP1: User research and problem statement
>Undertake interviews with stakeholders and future users to understand and clarify the problem statement
>Investigate how logic could be applied to create a margin analysis curve and calculate system constraints for optimising system capacity
>Identify quantifiable metrics to assess and benchmark scheduling decisions

WP2: Data Discovery and Investigation
>Investigate which data samples might be available and understand the impact of different data on the project
>Bulk download available data and perform exploratory analysis and data quality checks, creating dummy data where needed

WP3: Technical Assessment
>Check the feasibility of automatically building the margin analysis curve from WP1 using domain understanding where possible
>Assess how simulation and machine learning can be divided into roles to provide generator recommendations

WP4: Engineering Discovery
>Gain understanding of architectural elements to feed into design of the PoC build and understand the impacts of architecture in later phases

WP5: Business Case and Alpha Planning
>Assess the best solution design investigated thus far that will best deliver results for a prospective later project

The second (Alpha) phase will look to develop a PoC (proof of concept) using AI/ML and latest modelling techniques to perform margin analysis and to produce generator recommendations for day ahead scheduling, undertake user research and feedback from stakeholders to inform further development work, form recommendations for the development work, both for backend and front end, undertake a cost-benefit analysis of the solution based on the criteria from the discovery phase, and plan the infrastructure required should the project progress to the next stage, the follow-on activities to be decided as the project progresses.

WP1: User Research Solution Refinement and Testing

>Refine the problem statement from the previous phase and ensure alignment to the project plan that was developed in the previous phase
>Assess initial wireframes for PoC tool and get feedback to inform further iterations

WP2: Proof of Concept Development Recommendations
>Use static historic data to develop early-stage concept that will make recommendations for cardinal points

WP3: Proof of Concept Front End Build
>Build the front-end user interface and connect to the back-end recommendations tool so that it can be tested with the users

>WP4: Business Case
Undertake a cost-benefit analysis to check against the benchmark produced in the discovery phase

>WP5: Infrastructure
Evaluate deployment feasibility with architecture teams

>WP6: Beta Planning
Review project work to date and assess whether to create a plan for the next stages of work

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

Scope

This project aims to understand the challenges, approaches and options that could be developed in a new scheduling software that automates more of the SCED scheduling process that happens in the Electricity National Control Centre (ENCC). There will be two project stages:

In the discovery phase: conduct necessary user research with control room engineers and SMEs within NESO, and leverage design thinking to formulate solution design. This phase will also look into the data, tools and processes that would need to be implemented to improve the current process, understand the work that will need to be done in the PoC, undertake a technical assessment for the work that will be done, provide architectural design input for the PoC, and define the business case assessment criteria for the outputs of the next phase of the project.

In the Alpha phase: develop a PoC (proof of concept) using AI/ML and latest modelling techniques to perform margin analysis and to produce generator recommendations for day ahead scheduling, undertake user research and feedback from stakeholders to inform further development work, form recommendations for the development work, both for backend and front end, undertake a cost-benefit analysis of the solution based on the criteria from the discovery phase, and plan the infrastructure required should the project progress to the next stage, the follow-on activities to be decided as the project progresses.

Objective(s)

The objectives of this project are:
>Build a solution as proof of concept for automating the scheduling process, accounting for input data, given static historical data, that will:
  >Take as input a given settlement period,
  >Produce set of recommendations for every cardinal point in the next 4 to 24 hours,
  >Produce explanation of why those recommendations were provided,

>Allow NESO control room users as well as other internal stakeholders to see output on front end and adapt parameters for new

recommendations.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

This project has no direct impact on vulnerable consumers

Success Criteria

The project can be deemed successful if:

>A proof-of-concept model is capable of automating taking given settlement periods as input and produce a set of recommendations for every cardinal point in the next 4 to 24 hours and include an explanation of why those recommendations were provided

>This should include documentation on the software/models and explicitly explain the function of each script such that NESO engineers will be able to use it to develop the models further for the development of an MVP.

>Allow users to see outputs on a front end (UI) and adapt parameters for new recommendations.

>Produce a series of reports for each phase that shows the work that was done, the outcomes against the starting assumptions and

Project Partners and External Funding

Faculty AI – no external funding

Potential for New Learning

This project aims to understand the requirements for scheduling in the NESO electricity control room, and where the major issues are from a scheduling perspective. The work that will be done as a result of this will help to understand how the currently manual process can be improved with Artificial Intelligence (AI) to supplement the work of control room engineers.
At the end of a project, the project learning, including recommended next steps will be available on the ENA Smarter Network Portal.

Scale of Project

This project will investigate how models and tools can be implemented in a Critical National Infrastructure (CNI) system and will allow the Volta programme to step forwards in the balancing tools being developed for the programme. This project will take place over 36 weeks .

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

This project is being delivered by GB based suppliers and funded by NESO, it therefore has a geographical scope of Great Britain. Some activities may take place outside of the UK, subject to security requirements

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£1,000,000

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:

The project will be looking at understanding and improving the process of scheduling of dispatch options in the control room and will aim to increase the amount of secure, economic dispatch decisions that can be made in the control room in the future. This will facilitate the energy system transition by allowing for more economic and lower Levelised Cost of Electricity technologies such as solar and wind, thereby allowing cleaner sources of generation to proliferate.

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

There is not yet a clear method of understanding the cost benefits of this solution. It is expected that a better understanding of the impacts will be determined during the course of the project.

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

This project is looking at processes specific to NESO, and as such, will not be immediately replicable across networks. However, there will be potential for learnings, such as implementing machine learning and AI-based technologies that can be replicated in other areas for networks.

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

The costs of rolling this out are not yet know, but a better understanding of this will be developed during the 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

A better understanding of the dispatch process, and how to improve it is expected to be developed throughout the project. This understanding could help other networks develop capabilities on preventing congestion in local flexibility markets.

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.

Research has been undertaken to find projects that may be related to this one. There are no overlapping activities being done by other networks as far as has been determined.

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 is a project aimed at researching and reporting the novel and upcoming operational solutions of relevant SO counterparts across the globe, which operate in a variety of markets facing comparable challenges to NESO.
This project will investigate the use of machine learning and AI processes for the grouping of dispatch options in the control room. This has not been done by NESO, other networks, or other TSOs to date.

Relevant Foreground IPR

>Proof of concept scheduling models with documentation
>Reports on control room requirements around scheduling

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:
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@nationalenergyso.com
Details on the terms on which such data will be made available by National Energy System Operator can be found in our publicly available "Data sharing policy relating to NIC/NIA projects" at https://www.nationalgrideso.com/document/168191/download.

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

The tools and processes are not well understood and there is high risk in implementing the technologies. Indeed, it is uncertain whether the technology will be feasible for implementing in such a way, and as such, innovation funding is the most suitable route for this activity.

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

Due to the high levels of risk and uncertainty around the project activities, as well as the flexibility in timelines that are allowed by NIA funding, this route was determined to be the suitable option for this project.

This project has been approved by a senior member of staff

☑ Yes