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

Apr 2025

Project Reference Number

NIA2_NESO108

Project Registration

Project Title

Volta – Value and Feasibility Analysis for Input Data Models

Project Reference Number

NIA2_NESO108

Project Licensee(s)

National Energy System Operator

Project Start

March 2025

Project Duration

0 years and 5 months

Nominated Project Contact(s)

innovation@nationalenergyso.com

Project Budget

£670,000.00

Summary

Adaptive models are unsupervised machine learning models that can adapt their output and training data to accommodate new data. This prevents the need to manually retrain models based on static data and increases scalability and reduces resource for tagging and sorting data.

This project aims to assess the effectiveness, practicality, and benefits of implementing the adaptive data models within our operations, focusing on its impact on system optimisation and decision-making processes. The input data model will address several identified gaps in our current capabilities, aiming to enhance forecasting, optimisation, and situational awareness in various operational scenarios.

Preceding Projects

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

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

Third Party Collaborators

Mesh AI

Nominated Contact Email Address(es)

Innovation@neso.energy

Problem Being Solved

Optimisation solvers in the Electricity National Control Centre (ENCC) require good data inputs to provide actionable outputs that Operational Energy Managers (OEMs) use in their operations. However, the current process requires extensive manual data handling and transformation before the solvers can process it. This manual intervention consumes significant resources, slows down data processing speeds, and limits scalability, ultimately impacting the efficiency of operations and decision-making.

Method(s)

Task 1: Data Model Assessment

Objective: Evaluate the proposed adaptive input data model to determine its technical soundness and alignment with our operational requirements.

- Acquiring the necessary available data then reviewing the data and identifying critical data gaps.
- Explore and leverage alternative and innovative data sources to fill the identified gaps
- Comprehensive analytical analysis of historical data is performed to identify data characteristics, ranges, trends, and other indices which will be helpful in developing data governance screening and data cleaning processes.

Task 2: Feasibility Analysis

Objective: Assess the feasibility of implementing the input data model in NESO's operational environment.

- Evaluate the technical requirements and compatibility with existing systems.
- Analyse res ource requirements, including hardware, software, and personnel.
- Conduct a risk assessment to identify potential implementation challenges and mitigation strategies.

Task 3: Value Analysis

Objective: Determine the potential value and benefits of the adaptive input data model.

- Analyse the impact on system optimisation, operational efficiency, and decision-making processes.
- Quantify potential cost savings, performance improvements, and other measurable benefits.
- Compare the proposed model with current practices and alternative solutions.

Task 4: Recommendations and Roadmap

Objective: Provide actionable recommendations and a roadmap for implementation.

- Summarise findings from the data model assessment, feasibility analysis, and value analysis.
- Prioritise the order of developing adaptive models
- Develop a detailed implementation plan, including timelines, milestones, and resource allocation.

Propose monitoring and evaluation strategies to track the model's performance post-implementation.

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

TRL Steps = 1 (2 TRL Steps)

Cost = 2 (£670k)

Suppliers = 1 (1 supplier)

Data Assumptions = 2 (Medium)

Total = 6 (Low)

Scope

The analysis will cover the following tasks:

1. Data Model Assessment – evaluate proposed adaptive input data while identifying critical data gaps.

2. Feasibility Analysis – assess how the models could be implemented in the control room.

3. Value Analysis – analyse the potential benefits to operational efficiency, system optimization, cost savings, and compare against current practices and alternative solutions.

4. Recommendations and Roadmap – provide actionable recommendations and a detailed implementation plan.

Objective(s)

The project will:

· Evaluate the proposed adaptive input data model to determine its technical soundness and alignment with our operational requirements.

· Assess the feasibility of implementing the input data model in our operational environment.

· Determine the potential value and benefits of the adaptive input data model.

· Provide actionable recommendations and develop a roadmap for implementation.

Consumer Vulnerability Impact Assessment

This project will not impact vulnerable customers , as it is a research project looking into optimising control room operations.

Success Criteria

If the objectives are met, the project can be deemed successful if:

· Provides a summary of operational needs and delivers plan for the project

· Types of models are identified, input data defined, granularity of models, potential routes to integration are identified and defined. Justification of coding language included. Findings for each of the proposed activities are presented at workshop with key project stakeholders.

· An understanding of where the input data is adequate to overcome challenges and gaps in current tools and processes within NESO

· An understanding of the feasibility of using adaptive models including considerations of: retraining frequency (computational cost and trade-offs between compute equipment cost and speed), frequency of output update, model granularity (temporal and spatial). Report will discuss the potential value of the use of adaptive models including accuracy of model using co-defined metrics, model robustness to data inputs, and how the AI will be made explainable. Report will include exec summary of <2 pages.

· Actionable recommendations on the feasibility of implementing adaptive models in NESO's operations

Project Partners and External Funding

Project partner is Mesh AI, no external funding

Potential for New Learning

The project will assess the feasibility and efficacy of using adaptive data for training machine-learning models. This will help to understand the impact of adaptive models and how they affect the systems that are looking to be implemented, whether they will improve accuracy, and how to implement them to best effect.

The project learnings will be shared on the ENA Smarter Networks Portal.

Scale of Project

The project is a research project of smaller scale (4 months) that will inform larger scale projects in the future.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

Based upon the GB NESO area of operations

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

£670,000

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:

If the feasibility of using adaptive models is proven, the future implementation of these models would provide an increased level of accuracy in the predictions of generation from different types of generators (e.g. windfarms, DERs, Interconnectors), which in turn would enhance the optimisation of the renewable resources available in the 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

This is a research project and will not have a cost benefit as a result.

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

This method may be applicable across some other networks and operators, as there will be similar applications for adaptive models in other areas.

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

This is a research project and as such, there will be no costs of rolling out the method across GB.

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 project will determine whether adaptive models are feasible for use in power system operations, and will therefore inform other network licensees whether there is feasibility of using adaptive models in their operations should the project be successful.

The specific models that are appropriate in a power system context will be understood and will allow network partners to apply this knowledge to their benefit.

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.

The project was assessed through a comparative analysis against others that have taken place through both external funding streams and internal business activities, and the information on this project will be shared across the same areas to ensure that no duplication occurs.

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 adaptive models to predict the generation from different types of generators is a novel approach within NESO and has the potential to yield significant improvements in the optimisation of the renewable resources available.

Relevant Foreground IPR

- Feasibility Report
- Code with descriptive documentation

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 a part of it's business and usual activities

There is a high risk due to the unknown impacts of implementation of adaptive models within NESO. As such, the feasibility study will aim to understand whether it is possible to implement the technology and attempt to bring it to a sufficient TRL before undertaking it as BAU.

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 hopes to inform the development of low-TRL activities and methods, therefore innovation funding is more suitable for undertaking the research that will inform the direction of further work.

This project has been approved by a senior member of staff

☑ Yes