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

May 2026

Project Reference Number

NIA3_NESO002

Project Registration

Project Title

Neural BB Phase 2

Project Reference Number

NIA3_NESO002

Project Licensee(s)

National Energy System Operator

Project Start

April 2026

Project Duration

2 years and 1 month

Nominated Project Contact(s)

Innovation@neso.energy

Project Budget

£550,000.00

Summary

Electromagnetic Transient (EMT) studies are necessary to accurately assess system stability at times when renewables, batteries or HVDC links are the main sources of energy. EMT stability studies currently rely on manufacturer-provided “black box” models (compiled code). The Neural BB project (NIA2_NGESO082) which was completed in September 2025 showed that a neural network “surrogate model” of a windfarm could be used in place of its black-box model. This gives the potential for faster execution, recompilation without equipment-manufacturer support (which is often unavailable) and creating simple models to represent multi-converter subsystems. Neural BB II aims to extend this work from just a “proof of concept” windfarm to a diverse range of six models by April 2028. It will also investigate the potential for accelerating studies by implementing the surrogate models on a Graphical Processing Unit (GPU).

Preceding Projects

NIA2_NGESO082 - Neural BB

Third Party Collaborators

Transmission Excellence Ltd

Nominated Contact Email Address(es)

Innovation@neso.energy

Problem Being Solved

EMT studies are necessary to accurately assess system stability at times when inverter-based resources (IBR) – i.e. renewables, batteries or HVDC links – are the main sources of energy. EMT stability studies currently rely on manufacturer-provided “black box” model (e.g. compiled code) to accurately represent converters. This was unsatisfactory because:

i) Black box models adversely affect simulation performance in three ways: firstly because they can require a long time to compute each time-step, secondly because of the number of time steps they require before reaching a stable state suitable for studies, and thirdly because they lock-in operation on x86 CPUs and so cannot take advantage of accelerated computing (e.g. GPUs). While it is true that some black box models have better performance than others, all models in a simulation must run in lock-step, creating an effect where “the convoy can only travel at the speed of its slowest ship”.

ii) Since they are compiled code, black box models create lock-in to particular compilers and simulation software. They cannot be recompiled by the user to take advantage of more modern systems, and the original manufacturer (the only party who possesses the source code) is not always interested in long-term support. This is particularly problematic given that the assets being represented by the black box models are expected to last for decades.

Neural Black Box (NBB) was successful in achieving an accuracy of above 92%, we now have a methodology proven for surrogatisation wind farm models into neural model Blackbox models (excluding their dynamic control assets) using Mean Absolute Metrics (MAE). The tests focused on 3-phase-ground faults under various network conditions (e.g. fault impedance and location).

However:

i) We do not know if this works for other IBR technologies

ii) We do not currently know the limitations of this technology

iii) MAE was applied in only 1 disturbance type (balanced 3-Phase-Ground faults), we do not know how the model would react to other disturbances

iv) The training process was ad-hoc and although successful, a robust standard training methodology needs to be created that would work for different types of models that can be adopted by NESO

v) Using multiple NBB models would be bottlenecked by PSCAD being CPU centric while the models would work better in GPU centric programs

Method(s)

Neural BB II will build on the proof-of-concept work of the original NeuralBB project as follows:

i) The original NeuralBB undertook a proof-of-concept study on a single wind farm. Neural BB Phase 2 will extend this to cover a diverse range of different converter-based resources (renewable generation, HVDC, etc) and manufacturers. The aim is not to test surrogate models of every possible device, but to test a diverse range to show that the process of creating a surrogate model can be generally applied.

ii) As the original NeuralBB study only had one surrogate model it was not possible to verify that a diverse range of surrogate models would behave correctly when mixed together in a single grid simulation. NeuralBB Phase 2 aims to do this.

iii) The original NeuralBB study used a GPU to train a neural network to represent a wind farm. Despite this, inference (i.e. when the surrogate model was implemented as a user model within PSCAD) was undertaken on a CPU. GPUs can be much faster than CPUs in cases where many calculations are being undertaken in parallel, and this could be the case in situations where a grid simulation includes many surrogate models. Neural BB Phase 2 will seek to quantify the potential benefits of using GPUs to undertake the surrogate-model computations in large simulations.

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

WP0: Kick-off and implementations meeting

Meetings will be scheduled to discuss what exact models will be available for the project and handling of this data, including limitations overview. Additionally, the discussions will outline the initial accuracy outcomes that will be used to guide the accuracy metrics review.

o Outputs:

- Meeting(s) outlining clear plans, this is a starting point for requirements discussion

- Assess data availability and hardware and software readiness

o Expected outcome:

- Which models to be used and when models are to be received is assessed

- Initial hardware and software requirements are presented clearly as they form the basis of the assets that will be used

WP1: Testing of available NBB model and assessing limitations using GC tests and checking model interaction

A literature review will be conducted to assess different accuracy metrics for surrogate models, with a final list being created. These metrics will be used to assess the surrogate model created in NBB. Additionally, Grid Code tests will be used to assess any differences between the original model and the surrogate. Finally, simulations tests will be done to assess if copies of the model interact with each other in anyway.

o Outputs:

- Accuracy Metrics review

- EMT mode compliance and tests assessed with accuracy metrics

- Surrogate-to-surrogate copy interaction assessment

o Expected outcome:

- Metrics are assessed for our use-case and shortlisted for project

- Model is assessed with compliance and validation metrics, and a test list is created for the accuracy metrics

- A report is created outlining tests and accuracy review as well as the interaction assessment

WP2 (A-C): Training of different IBR technologies using various training parameters

For each of these work packages A-C 3 EMT models with be surrogatised and tested with the accuracy metrics found in NBB Phase 1. Additionally, any issues found in NB1 model will be resolved or mitigated. The models will be gradually added and tested together in a network which will mean the complexity of the network will increase with each WP.

o Outputs:

- 2 models/WP from the approved model type list is used to create training data

- 2 surrogate neural models/WP are created and trained using the data and tested against the original models with the test approved in WP1

- Models are tested in a network with increasing complexity

o Expected outcome:

- 6 surrogate models are created which have sufficient accuracy comparable with Neural BB (92%) and if not a reason or limitation is clearly stated

- An interaction and wider network assessment report is created outling issues and limitations found

WP3: Methodologies Assessment:

This WP will focus on improving the neural network based on lessons learned in the previous WPs. There will be a special focus on any variance in neural network performance between the different EMT model types. A best practice guide will be created by the end that will act the main source for training documents.

o Outputs:

- A comparison of accuracies between all the tested IBR technologies and assessment of differences is carried out

- A guide is created which outlines the best practices for creating surrogate models

o Expected outcome:

- A report is created outling any encountered limitations that are encountered, as well as any differences in the training process of each technology including training data creation

- A best practice guide is created that allows NESO PSEs to surrogatise EMT models that is clear to a non-ML-training expert

WP4: Development of acceleration of running Neural models with GPUs

Research will be conducted to leverage GPUs for acceleration of NBB's neural networks. This is crucial for considering using large amounts of neural models in a simulation. The main concept is to offload the neural network computation to GPUs while PSCAD utilises the CPU for all other workloads.

o Outputs:

- GPU acceleration of running neural surrogate models is investigated including but not limited to CUDA implementations of the code

- PSCAD-related surrogate model speed bottlenecks are investigated

o Expected outcome:

- A report is created outlining the different methods attempted and their limitations

WP5: Acceleration and deployment consultation

Final reports and guides for neural network training data creation, training and testing are created. Simultaneously, consultation meetings will be held with NESO internal IT and security to ensure the final delivered models and methodologies are compatible with NESO infrastructure and security guidelines.

o Outputs:

- Training acceleration methodologies investigated and used in the project are summarised

- A concise and clear list of hardware and software requirements for application of surrogatisation of EMT models is created

- Training and testing codes are checked by NESO security

- Consultation meetings are held with internal IT to ensure requirements are clear and IT knowledge in the project is transferred

o Expected outcome:

- A report is created that outlines training acceleration methodologies and hardware and software requirements

- A security check of the deliverable training and testing codes is carried out by NESO security

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

TRL Steps = 2 (4 TRL Steps)

Cost = 1 (£500,000)

Suppliers = 1 (1 supplier)

Data Assumptions = 2)

Total = 6 (Low)

Measurement Quality Statement

For WP0-1:

Expected to deliver a list of accuracy metrics using literature review methods and the NBB 1 model is tested for interaction with a copy of itself using EMT simulation

For WP2 (A-C):

Expected to deliver 6 neural network surrogate IBR models which will be assessed for quality dependent on the decided accuracy criteria in WP0 and WP1. All decided criteria will be measured through EMT simulation tests with comparison to the original EMT model.

WP3-5: The deliverables are a mixture of found limitations in simulations, best practice methodology based on learning gained in previous WPs as well as acceleration and co-simulation research and application where applicable.

Data Quality Statement

The project requires EMT models with enough detail to be an accurate representation of the technology type. There are 3 sources we can use and form the basis of project data source contingencies:

1- User EMT Models that we have as per GC141: This would be an ideal situation, we (both NESO and Transmission Excellence) will reach out to selected models' Users and their respective manufacturer and ask for their permission to share it with our supplier within an NDA structure identical to that done for previous NIA projects DETECTS (NIA_NGSO0031) and DETECTS II (NIA2_NGESO040)

2- PSCAD open models available for public download by MHI: These are fairly detailed in some technologies but are not tuned to a specific site like User models, they can still be used subject to our engineering judgement. No additional NDA would be required here.

3- Internal EMT models developed for various projects, we may not need an NDA depending on if the models contain any data from User models or Transmission Owners. In any cases where they do contain any such data, permission and NDAs will be pursued

This data will be required by WP2A start. However, we can start as long as we have at least 1 model, the others can filter through as they are needed but the plan is to start the acquisition early to avoid any delays.

Scope

The scope of NeuralBB Phase 2 includes the creation and testing and reporting of surrogate models for six particular converter-based resources (to be chosen by NESO). This is in addition to the creation of a surrogate model of a particular type of wind farm in the course of the original NeuralBB project.

The scope includes agreeing on test requirements, and the testing of these surrogate models – both individually and as part of an integrated grid simulation.

The scope includes creating an experiential framework for running GPU-based surrogate models from within a PSCAD study and using this to estimate the performance achievable from GPU-based surrogates in a fully developed production framework.

The scope does not include the deployment or roll-out of the surrogate-model technology, but it does include producing documents for use in planning such a deployment: test requirements, a surrogate-training best practice guide, and an "application guide" that would include consideration of practical issues involved in deploying the technology within NESO.

Objective(s)

The objectives of this project are to:

· Show that multiple diverse converter-based resources can be represented by surrogate models with sufficient accuracy for use in NESO stability simulations, including where many surrogate models are included in one simulation.

· Explore the potential for reducing the run-time of simulations by using GPUs, and quantify the advantage that might ultimately be achieved (it might not be fully achieved in this project).

· Produce documents that will assist in any future roll-out the surrogate technology.

Consumer Vulnerability Impact Assessment

The project has no impact that is specific to vulnerable classes of consumer. Its benefits (through maintained/increased reliability and/or reduced congestion costs) will be available to all classes of consumer.

Success Criteria

Key outputs

1. Surrogate versions of black box models can be successfully trained in most or all cases across six diverse converter-containing resources

Success criteria:

a. Models cover VSC, LCC, offshore windfarms, grid batteries with solar generation, dynamic voltage compensator devices and grid forming technologies

b. If these diverse surrogate models can be used in a grid simulation without any instabilities absent in the original models

c. If they have adequate accuracy dependent on established metrics in WP1 to within 92% and if not, reasons and/or limitations are identified

2. Development of a neural network EMT model surrogatisation process that is repeatable, consistent and accurate

Success criteria:

a. Models created consistently preform within accuracy metrics established in WP1 and if not, the reasons are identified

b. A best practice guide is produced that clearly outlines best practice for data creation, training and testing processes

c. Code is reviewed and approved by NESO security

d. Hardware requirements for maximum performance of models are passed to NESO

3. Tools that can be used for NESO to preform the surrogation process independently

Success criteria:

a. The tools should allow users to create training data sets from EMT models

b. The tools should allow users to preform EMT surrogate model training

c. The tools should allow the user to test EMT surrogates against the accuracy metrics developed in the project

2. Neural network model acceleration is investigated

Success criteria:

a. Acceleration of neural network training using GPUs is investigated and solutions applied where applicable

b. Acceleration of neural network runtime using GPUs is investigated and solutions applied where applicable

Project Partners and External Funding

1 partner: Transmission Excellence Ltd. No external funding.

Potential for New Learning

The original Neural BB project has shown that it is possible to represent a particular wind farm using a surrogate model. Neural BB II aims to extend the original proof of concept by showing that surrogate models can be used in large-scale grid simulations involving a diverse range of inverter-based resources. Learning will be disseminated via deliverables that are specifically aimed at NESO staff who are working in grid stability studies and who are considering how best to roll-out improved stability studies.

At the end of this project, the project learning (including recommended next steps) will be available on the ENA Smarter Network Portal.

Public Disclosure:

The exact details of the topology and node functions of the neural network developed will be considered confidential since they would adopt into NESO procedures subject to project outcome and internal testing after project completion. However, in the closure and public report we will still explain the principle of operation and methodologies undertaken generally, what improvements were made and the impacts of these improvements on the model. Additionally, the lessons learned will be explained along with any issues and/or limitations found.

The results will mainly be accuracy metrics; the disclosure here will depend on the sources of the original models to be surrogatise. We plan to apply the same data protection to those surrogates as the originals. This extends to waveforms and data derived from those models. However, aggregated accuracy metrics will be used which will maintain confidentiality while still showing the project results.

On the other hand, in cases where we used open-source models we will share those results waveforms to show a comparison between original and surrogate models since there is no confidentiality restrictions in this case.

Scale of Project

A smaller scale project (i.e. NeuralBB) has already been completed. This provided an initial proof-of-concept, showing that a wind farm could be represented using a surrogate model. The next step toward deployment is to verify that a stability simulation can use a diverse range of surrogate models without losing accuracy, and this is what NeuralBB Phase 2 aims to do. A smaller scale project is not feasible, as this smaller-scale proof-of-concept work has already been completed.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

The ideas being developed by this project are not bound to any particular geographical area, and should be applicable anywhere in NESO's operational area (i.e. Great Britain).

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

Project spent broken down by work package:

- WP0 - Kick-off and implementations meeting - £45,000
- WP1 - Testing of available NBB PH1 model and assessing limitations using GC tests and checking model interaction - £30,000
- WP2-A -Training of different IBR technologies using various training parameters - £85,000
- WP2-B - Training of different IBR technologies using various training parameters - £85,000
- WP2-C - Training of different IBR technologies using various training parameters - £85,000

- WP3 - Methodologies Assessment - £30,000
- WP4 - Development of acceleration of running Neural models with GPUs - £45,000
- WP5 - Acceleration and Deployment Consultation - £45,000

Total estimated project cost £550,000

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:

The energy transition involves the replacement of fossil fuelled power generation with renewable sources, especially wind and solar. It also involves increased use of battery energy storage and HVDC transmission. The application of wind, solar, batteries and HVDC technologies all involve the replacement of synchronous machines with power electronic (transistor-based) converters.

In order to ensure that the grid remains secure, despite this transition to converter-based devices, the simulations undertaken by NESO to check grid stability following credible contingencies will need to be upgraded to use more accurate EMT techniques (traditional techniques are accurate with synchronous machines, but not when converters are the dominant source of power).

A key factor that is impacting on the transition to EMT is that EMT studies have relied on “black box models” of converter-based resources, and these models have a variety of problems (see section 2.1). By removing these problems, surrogate models have the potential to make EMT studies much easier, allowing the energy transition to happen without adverse effects on grid stability and/or operational costs.

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

The project aims to develop the research stage reached in Neural BB into a demonstration-level which can implemented then trailed on a small scale after the project completion.

Scenario:

An EMT study needs to be undertaken to study the risk of a converter interaction in a low strength system scenario. This would mean that some renewable generation behind a certain set of circuits would need to be constrained and curtailed by a certain amount incurring costs for consumers. 3 engineers are assigned who define the area of the study dependent on the type of interaction and interactivity of buses.

Note: Scenario for comparison is only representative of generic EMT study for a system issue and not to be taken as a description of NESO internal policies.

Costs:

- Base method case cost:

The engineers would spend 4 weeks to reduce a large EMT model into the study region and have it match the parameters of the expected scenario in the GB network. Additionally, they needed to decide which generators and dynamic voltage devices need to be modelled in detail and which can be replaced with generic models. This is because they need to run 10-30 sensitivity cases to assess the risk of an interaction occurring. Each of these simulations takes between 1 hour and 4 depending on the size of the network, number of models and detail.

o Employee costs:

3 engineers calculated at £500 per day

- 5 weeks of reduction and modelling: £37.5k

- Assuming they each do 10 cases in parallel, and each take a week: £7.5k

· Method Cost:

o Hardware: Level of implementation in project is 1-2 high-performance computers (HPC). The cost will vary as the final hardware requirements are to be assessed in WP5.

- Small trial Retrofitting 1-2 HPCs (Trial) – estimated costs of £3.5k per machine (e.g. high-end CPU, GPU and possibly motherboard upgrade): £7k

o Software: There is no expected additional software licensing costs as base technology is meant to be compatible with current NESO environments and software.

o Employee hours:

- Engineers would not need to reduce the network and would only need to dispatch it taking 2 weeks: £15k

- Simulations would take half the time and hence half the employee hours: £3.75k

· Benefit (Base Cost – Method Cost)

o Including 2 HPC retrofits: £45k – £25.75k = £19.25k

o Excluding HPC retrofit costs: £45k – £19.25k = £25.75k

· Limitations of calculation:

o EMT studies are common and similar benefits would be gained in every single study regardless of study type due to halving of simulation time

o HPC retrofit is a one-time cost and would not be incurred every study. Larger rollout would depend on vendor costs and number of users but would add scale-up efficiencies

o Training and testing time for neural models was accounted for as it would only need to be done once for every GB generator model and can then the neural model can be re-used without retraining

o Halving of simulation time is a pessimistic figure, in networks entirely working with neural models' literature suggest reduction to 25% of original time

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

The project pertains software tools that could surrogatise any EMT model. This means that there are no geographical limitations. As long as an EMT model of a generator, battery or dynamic voltage asset is present then it can be surrogatised regardless of where it is connected. The resulting surrogate should be deployable in any EMT network model regardless of what geographical area the model represents.

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

The Neural BB Phase 2 project should establish (with a reasonable degree of certainty) whether there is a single training process that can be applied to any converter. If this is the case, it would make it easier and cheaper to undertake the large-scale creation of surrogate models.

It is difficult at this stage to estimate exactly how much effort would be required to create each surrogate model, but if a single common process can be applied then it should be possible to automate the process. A low-end estimate of the cost, therefore, would be £5k per converter design times 100 converter designs and special sites with unique mixes of different converters (e.g. embedded solar and wind). This would give a total of £500k. In addition to this, work on the automation of the process might have a one-off cost of £200k. This would give an overall low-end cost of £700k.

Note that this price does not include changes to allow the surrogate model to run on a GPU. This project will allow the cost of rolling out GPU-based surrogates to be estimated.

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 aims to show how a surrogate models can be created for a diverse range of converter-based resources and used together.

For this learning to be used by NESO (and potentially other network licensees), the technique would need to be rolled out so that it covers most (or even all) of the black box models currently in use. By converting a diverse set of black box models to surrogates the Neural BB Phase 2 project aims to show (to a reasonable degree of certainty) that this is feasible. Actually undertaking the conversion of most/all models would require a further project to develop software that would automate the black-box-to-surrogate conversion process (see section 3.2.4).

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.

We are not aware of any other work (anywhere in the world) that has created surrogate models for EMT studies. The NeuralBB Phase 2 project builds on the original NeuralBB (NIA2_NGESO082) project but does not duplicate it. Neural BB sought, as a proof of concept, to use machine learning to create a surrogate model from a known generic EMT model whereas for NeuralBB Phase 2, models of different types of asset will be surrogatised, simulations with multiple surrogate models will be tested for the first time, and the use of GPU acceleration will be explored for the first time.

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

We are not aware of any other work (anywhere in the world) that has created surrogate models for EMT studies. The NeuralBB Phase 2 project is innovative as it will:

i) Create EMT surrogate models of systems other than wind farms, which has not been done before.

ii) Check that multiple EMT surrogate models can work together, which has not been done before.

Investigates the potential for running EMT surrogate models on a GPU, which has not been done before.

Relevant Foreground IPR

Deliverables are reports and six surrogate models (i.e. six sets of weights and biases) for six different converter-based resources. Source code would be provided to allow these surrogate models to be run on a CPU within PSCAD, and to be run on a GPU. No background IPR would be required to run these surrogate models.

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@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

Despite the completion of the original NeuralBB project, the concept remains at a modest level of maturity (TRL 4) and therefore has medium-high risks, making it inappropriate for NESO to pursue it as part of business as usual.

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 concept is at a modest level of maturity (TRL 4) and therefore has medium-high risks, making commercial funding difficult.

Furthermore, the expected benefits involve replacing black box models with surrogate models for which NESO (and possibly other network licensees) will have the source code, preventing “lock in”. This is a benefit for NESO and the consumer, but it also makes it difficult for any enterprise to profit from the innovation.

This project has been approved by a senior member of staff

☑ Yes