NIA Project Registration and PEA Document

Date of Submission:

*Notes on Completion: Please refer to the NIA Governance Document to assist in the completion of this form. Please use the default font (Calibri font size 10) in your submission. Please ensure all content is contained within the boundaries of the text areas. The full-completed submission should not exceed 10/12 pages in total.*

1. Project Registration

|  |  |  |
| --- | --- | --- |
| Project Title (*This cannot be changed once registered*) |  | Project Reference |
| Dispatch Decision Intelligence |  | NIA2\_NGESO075 |
| Funding Licensee(s) |  | Project Start Date |
| NESO |  | August 2024 |
| Nominated Project Contact(s) |  | Project Duration |
| Manos Loukarakis |  | 6 months |
| Contact Email Address |  | Project Budget |
| innovation@nationalenergyso.com |  | £550,000 |

**Project Summary (125 words limit)**

This project will design and deliver key innovations to the Dispatch Decision Intelligence to improve decision support tools for control room engineers. This will be achieved through powerful developments and upgrades in performance, functionality and analytics. If successful, these upgrades will offer deeper and more accessible analysis, improved solution quality and reduced optimisation solve times.

**Benefits Summary (125 words limit)**

The project is intending to deliver methodologies to support:

* Enhanced control room user experience of National Dispatch through improved quality of analytic information offered and reduced optimisation solve times.
* Increase dispatch transparency and support the goal of zero preventable skips.
* Reduce the balancing costs for NESO.

**Lead Sector**

|  |  |
| --- | --- |
| Electricity Distribution | Gas Distribution |
| Electricity Transmission  X | Gas Transmission |

**Other Sectors**

|  |  |
| --- | --- |
| Electricity Distribution | Gas Distribution |
| Electricity Transmission | Gas Transmission |

**Primary Research Area** *(Please select just one)*

|  |  |
| --- | --- |
| Net zero and the energy system transition | Optimised assets and practices  X |
| Flexibility and Commercial Evolution | Whole Energy System |
| Consumer Vulnerability | Data and Digitalisation |

**Secondary Research Area** *(Please select up to two)*

|  |  |
| --- | --- |
| Net zero and the energy system transition  X | Optimised assets and practices  X |
| Flexibility and Commercial Evolution | Whole Energy System |
| Consumer Vulnerability | Data and Digitalisation |

**Development steps**

|  |  |
| --- | --- |
| Technology Readiness Level (TRL) at Start  6 | TRL at Completion  7 |

1. Project Details
   1. Problem(s)

NESO has a strategic goal to operate the electricity grid carbon free for periods of the year by 2025 and to be carbon free year-round by 2035. Achieving these goals will be impossible without using more low-carbon units on the grid. These units can be more highly fluctuating and smaller than traditional units, making them a challenge for grid balancing. In order to access the carbon savings offered by these technologies, NESO is in the process of transforming balancing services to make them more flexible, efficient and transparent.

Optimising and improving systems for efficient dispatch is central to meeting Net Zero challenges securely and affordably. In 2024, NESO introduced the Bulk Dispatch Optimiser on the Open Balancing Platform (OBP) and NESO is now readying the National dispatch optimiser on OBP for release in 2025. These tools form the basis for NESO’s automated solution processes to dispatch however further innovations to enhance dispatch algorithms and improve explainability are required to maximise their adoption and effectiveness.

* 1. Method(s)

This section should set out the Method or Methods that will be used in order to provide a Solution to the Problem. The type of Method should be identified where possible, eg technical or commercial.

For RIIO-2 projects, apart from projects involving specific novel commercial arrangement(s), this section should also include a Measurement Quality Statement and Data Quality Statement. [You can find more information here](https://nationalgridplc.sharepoint.com/:w:/s/GRP-INT-UK-ESOInnovation/EUHa8ywhnJ9EmaRDlEXTOGcBR-ixyoa2Nd9onfMs66xdsw?e=fefb74).

This project focusses on delivering advanced Decision Intelligence to dispatch optimisation in order to enhance operator collaboration and trust with the balancing dispatch algorithms. This will be achieved through researching and developing six powerful technical upgrades that can be incorporated into the optimisation tools if the project is successful. These are detailed below and will be designed to enhance the performance, functionality and analytics of the tool, offering deeper and more accessible analysis, improved solution quality, and reduced optimisation solve times.

Overall, the project will develop suggested innovations for dispatch algorithms, and by evaluating the suitability of the Bulk Dispatch Optimiser (BDO) to acquire equivalent capabilities. Along with monthly project review reporting, there will be monthly code releases throughout the project. Each release will be reviewed and tested prior to release in accordance with a defined testing and delivery process agreed between the project partners.

Warm starts and heuristics (speed ups):

1. Warm starts

A candidate solution available at the beginning of a solve can be used as a “warm start”, giving the optimiser a better starting point to iterate from, potentially reducing the path to optimality. The project will consider feasible solutions for achieving optimisation from warm starts, this may be the solution from the previous National Dispatch Algorithm run but may need to consider alternatives when considering the overall power and response problem.

1. Heuristics

In addition to warm starts, this work package will investigate the design of heuristics for generating other candidates. Suitable heuristics generate feasible solutions independently from the main solve for use as a warm start or even during the solve time, with the aim of reducing overall solve time.

1. Intelligent early stopping:

Early stopping is the process of terminating the optimisation computation when it is deemed likely that it is close enough to finding a truly optimal solution, trading off minimal further gains for faster total solve time. This is vital when considering complex optimisation problems, but deciding when to stop algorithmically requires careful consideration. This project will investigate and document-controlled forms of early stopping with more nuanced conditions for termination. Combinations of different approaches will be assessed on a suite of test scenarios to determine which combinations provide the best balancing of run time against solution quality.

1. Explainable optimisation (XO):

The dispatch optimisation problem is highly complex, with many possible decisions that must respect multiple constraints. Explainable optimisation will give clear, objective reasons for why units are advised to be dispatched based on hard constraints. Not all of the information needed to make dispatch decisions is available as inputs to the National Dispatch Optimiser , and the project will consider runtime explanations alongside dispatch algorithms advice to highlight what additional information would be needed for future automation.

This project will deliver explainable optimisation design which specifies information provided from both online and offline dispatch algorithm run modes for dispatch explanations. This will include clarifications of any overlap in requirements and capability between offline and runtime use, and design of the required combination of XO runtime and offline run mode. The project will consider how to summarise and present the XO to the control room to ensure explanations of the optimisation advice are presented cleanly and effectively.

1. Transparency decision insight

The project will investigate how post-hoc insight could be used to determine whether early stopping of the optimisation solver may have led to a non-optimal solution advised out of merit-order. In investigating this in combination with explainable optimisation, it is envisaged that far greater intelligence of the solutions produced could be enabled, addressing advice in far greater depth.

1. Headroom and foot room interrogation

This will include engineering potential suitable run modes that removes the generation matching requirement from the objective and the constraints, enabling computation of boundaries between different cost bands. It is expected that this will demonstrate the capability of generating a forecast of headroom and footroom that satisfies dispatch constraints, adding in the constraint to satisfy merit order at each time point. The project will develop interactive visualisations to interrogate the effects of constraints on forecast headroom and footroom.

1. Modernised alarms

To increase control room decision intelligence and trust, the project will investigate alternatives to dual values for addressing solution sensitivity and alarm raisers, including what assumptions and computation they require. For offline calculations, greater computational load may be acceptable, but for real time use the calculation needs to be of comparable complexity to the current use of dual values.

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

TRL Steps = 1 (2 TRL steps)

Cost = 1 (<£500k)

Suppliers = 1 (1 supplier)

Data Assumptions = 2.

Total = 5 (Low)

* 1. Scope

The scope and objectives of the Project should be clearly defined including the net benefits for consumers (eg financial, environmental, etc). This section should also detail the financial benefits which would directly accrue to the GB Gas Transportation System and/or electricity transmission or distribution.

The next steps in balancing transformation need to be carefully evaluated before an implementation pathway is defined. For this reason this project will consider delivering decision intelligence for dispatch in two ways: by developing suggested innovations for the Modernised Dispatch Algorithm and by evaluating the suitability of the Bulk Dispatch Optimiser (BDO) to acquire equivalent capabilities.

The suggested innovations to be developed for the dispatch algorithms include:

• Warm starts and speed-ups

• Intelligent early stopping

• Explainable optimisation

• Transparency decision insight

• Headroom and footroom interrogation

• Modernised alarms

As each of the above improvements are developed, they will assess whether a similar improvement could benefit the other optimisers including BDO and, if it could, how that could best be implemented following this project.

* 1. Objectives

The proposed innovations for Dispatch Decision Intelligence will meet the following objectives:

* Enhanced control-room user experience of dispatch decision advice through improved quality of analytic information offered and reduced optimisation solve times.
* The solutions will be evaluated for applicability to other available Optimisers (for example, the BDO).
* Support balancing engineers in decision making under time pressure​.
* Reduce the balancing costs for NESO​.
* By facilitating the dispatch of lower carbon technology units, support NESO in a swift and secure transition to net zero.
  1. Consumer Vulnerability Impact Assessment (RIIO-2 projects only)

Details of the expected effects of the Method(s) and Solution(s) upon consumers in vulnerable situations. This must include an assessment of distributional impacts (technical, financial and wellbeing-related). For RIIO-1 projects please add “Not Applicable”

The NESO does not have a direct connection to consumers and therefore is unable to differentiate the impact on consumers and those in vulnerable situations. Benefits to all consumers are detailed in 3.1

* 1. Success Criteria

Details of how the Funding Licensee will evaluate whether the Project has been successful. This cannot be changed once registered.

This project will be deemed to be successful if the identified innovation opportunities can provide potential improvements to future dispatch advice tools, including: warm starts and speed-ups, and intelligent early stopping which aim to ensure that the dispatch algorithm runs accurately, efficiently and at a time scale which reflects the needs of the operations of the control rooms.

The development of explainable optimisation, the modernisation of alarms and the inclusion of head and footroom interrogation will support improved trust in the recommendations made, enable quicker decision making, decrease cost and facilitate carbon savings.

The project is designed to support NESO on their transformation journey, by helping decision makers to assess the capabilities of dispatch algorithms and BDO (Bulk Dispatch Optimiser). The report on BDO will help to estimate the work necessary to incorporate the innovations in National Dispatch Optimiser into BDO and give insight into the differing capabilities of the two different dispatch tools.

* 1. Project Partners and External Funding

Details of actual or potential Project Partners and external funding support as appropriate.

Smith Institute

No external funding.

* 1. Potential for New Learning

Details of what the parties expect to learn and how the learning will be disseminated.

Throughout the project, the NESO Electricity National Control Centre (ENCC) will be engaged to understand how decreased optimisation solve times and more accessible decision support could improve their ability to make decisions under time pressure.

The project will help to understand what, if any, compromises on solution quality are evident when mechanisms to decrease solve time, like early stopping and warm starts, are employed. Further to this, the outcomes are expected to improve the ability of the ENCC to understand why and how alarms are raised within the dispatch advice and empower them to understand why particular units were selected by the optimisation tools.

Final project reports will be published on the   
Smarter Networks Portal.

* 1. Scale of Project

The Funding Licensee should justify the scale of the Project – including the scale of the investment relative to the potential benefits. In particular, it should explain why there would be less potential for new learning if the Project were of a smaller scale.

BP1 of the balancing transformation delivered £48m in cost savings, realised through balancing costs and we hypothesise that improving situational awareness for balancing engineers and other stakeholders by providing additional decision intelligence through Modern Dispatch Advisor (MDA) could release further cost and carbon savings. In addition to optimising the balancing cost, improvements to dispatch would support NESO in their goals of maintaining security of supply while moving toward zero carbon and encouraging increased market participation.

* 1. Geographical Area

Details of where the Project will take place. If the Project is a collaboration, the Funding Licensee area(s) in which the Project will take place should be identified.

This project is being delivered by GB based suppliers and funded by NESO, it therefore has a geographical scope of Great Britain.

* 1. Revenue allowed for in the current RIIO settlement

An indication of the funding provided to the network licensee within the current RIIO settlement that is likely to be surplus to requirements as a result of the Project.

None

* 1. Indicative Total NIA Project Expenditure

An indication of the total Allowable NIA Expenditure that the Funding Licensee expects to reclaim for the whole of the Project (RIIO1).

An indication of the Total NIA Expenditure that the Funding Licensee expects to reclaim for the whole of the Project (RIIO2).

£550,000

1. Project Eligibility Assessment

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).

* 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:

* + 1. How the Project has the potential to facilitate the energy system transition:

In December 2023, NESO launched OBP, an integral step in the journey to creating a modern, open, reliable, resilient and secure technology platform. As the next step in the transition, NESO released the Bulk Dispatch Optimiser (BDO) onto the new platform. This first step has been successful and the next step is to facilitate additional dispatch improvements. These improvements could be achieved by readying National Dispatch Optimiser for release onto OBP or by adopting the capabilities of National Dispatch Optimiserinto BDO. In either scenario, ENCC leadership aims to continue innovating and improving the functionality on offer to Balancing Engineers, by innovating additional functionality which can be incorporated into the OBP.

At runtime, ENCC engineers can use the advice explanations to help decide on what the best action to take is

The methodologies and structure developed within this project could be reused for other optimisation models.

* + 1. How the Project has potential to benefit consumer in vulnerable situations:

N/A

* 1. 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.

* + 1. Please provide an estimate of the saving if the Problem is solved (RIIO-1 projects only)

N/A

* + 1. Please provide a calculation of the expected benefits the Solution

This is for Development or Demonstration Projects, not required for Research Projects. It should be (Base Cost – Method Cost, Against Agreed Baseline) and include a description of the recipients of the benefits.

The expected financial benefits of this solution would be derived from the increased ability of ENCC to choose less expensive energy sources in the price stack, while knowing that the system is still secure for that price. This would accrue to a decreased balancing cost over time. Because the dispatch of renewable resources can be more complex, improving the quality of decision support on offer, in conjunction with other innovations such as the Bulk Dispatch Optimiser, should facilitate the choice of those lower carbon technologies, leading to carbon savings in the future.

* + 1. Please provide an estimate of how replicable the Method is across GB

This must be in terms of the number of sites, the sort of site the Method could be applied to, or the percentage of the Network Licensees system where it could be rolled-out.

As the DNOs navigate the transition to DSOs, a transition necessitated by the emergence of an increasing number of distributed energy resources at various scales on the grid, they may need to examine whether dispatch improvements made in the high voltage network may have corollaries in the lower voltage networks. The methods proposed in this project may be applicable to current and future DSOs.

* + 1. Please provide an outline of the costs of rolling out the Method across GB.

This is very difficult to do, as DNOs are at different stages of digital maturity and also have varying requirements, depending on the needs of the particular geographic context which they serve. Any projects to translate these methods to DNOs would be necessarily bespoke.

* 1. Requirement 3 / 1 – involve Research, Development or Demonstration
     1. RIIO-1 Projects

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 systems and 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 GB electricity transmission or distribution systems |  |
| A specific novel commercial arrangement |  |

* + 1. RIIO-2 Projects

A RIIO-2 Project must involve the Research, Development or Demonstration of at least one of the following:

|  |  |
| --- | --- |
| 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 | X |
| 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 |  |

* 1. Requirement 4 / 2a – develop new learning

A Project must develop new learning that can be applied by Gas Transporter and/or Electricity Transmission or Electricity Distribution licensees. For RIIO-1 Network Licensees may wish to address challenges specific to their network.

Please answer one of the following:

* + 1. Please explain how the learning that will be generated could be used by relevant Network Licenses

As the DNOs navigate the transition to DSOs, a transition necessitated by the emergence of an increasing number of distributed energy resources at various scales on the grid, they may need to examine whether dispatch improvements made in the high voltage network may have corollaries in the lower voltage networks. The methods proposed in this project may be applicable to current and future DSOs.

* + 1. Or, please describe what specific challenge identified in the Network Licensee’s innovation strategy is being addressed by the Project (RIIO-1 only)
    2. Is the default intellectual Property Rights (IPR) position being applied?

This cannot be changed once registered.

|  |  |
| --- | --- |
| Yes  X | No |

If “no”, the following questions must be answered:

* + - 1. Demonstrate how the learning from the Project can be successfully disseminated to Network Licensees and other interested parties:

N/A

* + - 1. Describe how any potential constraints or costs caused, or resulting from, the imposed IPR arrangements:

N/A

* + - 1. Justify why the proposed IPR arrangements provide value for money for customers:

N/A

* 1. Requirement 5 / 2c – be innovative

A Project must be innovative (ie not a business as usual activity) and have an unproven business case entailing a degree of risk warranting a limited Research, Development or Demonstration Project to demonstrate its effectiveness. This could include Projects which are untested at scale, or in relation to which there are risks, which might prevent the widespread deployment of the equipment, technology or methodology.

* + 1. Why is the project innovative?

RIIO-1 projects must include description of why they have not been tried before.

For national dispatch to function as one of the tools available to inform dispatch, the Open Balancing Platform needed to be available as a foundational system. Work was paused on the Modern Dispatch Advisor (MDA) in 2022 because these underlying systems were not optimal for further digitisation of balancing as a function. The launching of OBP in December 2023 has given the green light to a host of new capabilities which can now work together to enhance the control room operations. Further Innovations to the MDA and a review of BDO will help to ensure that developments in understanding of the balancing problem are reflected in the tools developed to support balancing engineers.

* + 1. Why is the Network Licensee not funding the Project as part of its business as usual activities?

The MDA has not been deployed on OBP, and as such is a tool that has not yet been part of BAU. It is an innovation in its own right, and this project aims to build on that innovation with additional functionality which has now become appropriate to the complex problem of enacting dispatch from the control room.

* + 1. Why can the Project can only be undertaken with the support of NIA?

This must include a description of the specific risks (e.g. commercial, technical, operational or regulatory) associated with the Project.

Several of the capabilities we are aiming to develop may not have the impact we are hoping – for example, we may realise that warm start and early stopping capabilities compromise the solution quality in unacceptable ways or that the alarm raiser logic cannot be improved within the constraints of the mathematical problem being solved. These risks are low but mitigations have been proposed for them. In the case of explainable optimisation and head and footrool interrogation, there is a risk that the provision of these tools will not make a measurable impact on control room operations as they do not work within the timeframes/operational constraints of the control room. These are risks that can be mitigated with clear communication between the project partners.

* 1. Requirement 6 / 2d – 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.

* + 1. Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

The MDA has not been deployed on OBP, and as such there is no other tool that performs the function it is designed to perform. It is true that the BDO could be adapted to perform the same function, and it is for this reason that the project encompasses both the development of the MDA and a review of the BDO, with particular emphasis on the adapting BDO to accept the innovations proposed. This means that the review of BDO should provide some clarity on the best way forward for balancing transformation and when this is enacted, there should be no unnecessary duplication.

* + 1. If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

N/A

**Relevant Foreground IPR**

*Please provide a list of the relevant foreground IPR that will be generated in the course of the project e.g. reports, models, tools etc*

The following foreground IPR is expected to be generated in the course of the project*:*

1. Technical reports for all project deliverables.
2. Software code to guide implementation where relevant.

**Data Access Details** *(standard NESO response - please do not edit)*

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’. NESO 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 [Innovation | National Energy System Operator (neso.energy)](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 NESO can be found in our publicly available “Data sharing policy relating to NIC/NIA projects” at <https://www.nationalgrideso.com/document/168191/download>.

1. PEA approval

The senior person (RIIO-1) or senior network manager (RIIO-2) responsible for implementing RIIO-2 NIA Projects must approve the PEA. It must then be published on the Project Registration page of the Smarter Networks Portal.

|  |  |
| --- | --- |
| **Please confirm this project has been approved by a senior member of staff** | X |