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 |
| Regional Dynamic Reserve Setting |  | NIA2\_NESO080 |
| Funding Licensee(s) |  | Project Start Date |
| NESO |  | September 2024 |
| Nominated Project Contact(s) |  | Project Duration |
| Sana Razak |  | 12 months |
| Contact Email Address |  | Project Budget |
| innovation@nationalgrideso.com |  | £ 700,000 |

**Project Summary (125 words limit)**

Reserve is essential in securing the electricity grid. Choosing how much reserve to procure is a balance between risk and cost. This problem has been tackled in a previously successful project named Probabilistic Machine Learning Solution for Dynamic Reserve Setting (DRS) NIA2\_NGESO003; however, this project considered reserve at the national level and in practice, different amounts of reserve are required in different locations across Great Britain. This project will further the DRS work by building explainable, risk-based dynamic models for reserve that generate predictions at finer spatial resolutions. Using these models, NESO will have access to accurate, risk-based predictions of reserve requirements at different locations and can then make more informed decisions to maximise its usage and minimise costs.

**Benefits Summary (125 words limit)**

Setting the reserve regionally could unlock further savings by allowing NESO to procure reserve where it is required, lowering transmission losses, ensuring reserve purchased is not inaccessible due to constraints, further lowering overall reserve setting costs by allowing for offsetting of reserve in neighbouring regions. Also, the benefits to consumers would be lower energy costs and carbon emissions. Better modelling reserve requirements at desired risk appetites would maintain the trajectory that NESO is on to move to a carbon free electricity grid by 2035 and to do so in a way that maintains security of supply while optimising the balancing cost.

**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  3 | TRL at Completion  7 |

1. Project Details
   1. Problem(s)

This should outline the Problem(s) which is/are being addressed by the Project. This cannot be changed once registered.

Procuring reserve day ahead at the national scale can result in situations where some of this reserve is inaccessible when needed as it is located behind a constraint boundary. In cases where this occurs, additional costs are incurred that could be avoided by better understanding reserve requirements in different regions of the country. The previous DRS project proved that setting reserves dynamically can yield savings and this project will extend this success to look at dynamically setting reserve regionally

* 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).

The project comprises four work packages (WPs) to build, validate and incorporate the required regional reserve models for flexibly defined regions. The first work package will focus on acquiring, cleaning and processing data, ensuring that the current data processing code for national DRS is adapted to accept regional data. In the second work package, data will be aggregated at specified spatial scales and modelling code will be adapted to predict at these spatial scales. The third work package centres on training, tuning and validating the new regional models. At the end of this stage, a proof of concept judgement will be delivered for Regional DRS.

If the proof of concept judgement is in favour, a fourth work package will focus on further finetuning of the models and developing a PowerBI dashboard which will be delivered with the refined codebase.

The benefits to NESO of regional-level reserve modelling are:

* Insight not only into how much reserve will be needed at a given time, but also where this reserve will be needed
* Additional reserve setting savings which can be delivered without compromising on system stability

The financial benefits of this project would directly accrue to the GB electricity distribution.

* 1. 2.3 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.

This project will deliver explainable, risk-based dynamic models for reserve setting that generate predictions at finer spatial resolutions. These predictions will be derived by applying machine learning techniques to data that has been provided by the Frequency Risk and Modelling Group who specify the requirements of the models and evaluate the findings.

The benefit to NESO and National Grid of regional dynamic reserve setting is that accuracy in forecasting enables the secure delivery of additional reserve setting savings. BP1 of the balancing transformation journey delivered £368m in reduced balancing and reserve setting costs, and regional DRS would form part of the drive for continuous forecasting product improvements.

* 1. 2.4 Objectives

This cannot be changed once registered.

Early estimates as to the value of setting reserve dynamically on a national scale indicate that it has the potential to deliver up to 300MW of reserve savings per settlement period. Setting the reserve regionally could unlock further savings by allowing NESO to:​

* Procure reserve where it is required, lowering transmission losses​
* Ensure reserve purchased is not inaccessible due to constraints and so minimise regret spend ​
* Further lower overall reserve setting costs by allowing for offsetting of reserve in neighbouring regions​
  1. Better modelling reserve requirements at desired risk appetites would maintain the trajectory that NESO is on to move to a carbon free electricity grid by 2035 and to do so in a way that maintains security of supply while optimising the balancing cost2.5. 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 intended outcome of this project is to lower the cost of balancing for NESO and hence consumers, which will have the greatest benefits for those who are vulnerable,

* 1. 2.6 Success Criteria

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

* Delivery of dynamic, regional level reserve models with accompanying validation results showcasing performance
* Identification of key factors driving reserve predictions in each region from these models
* Delivery of codebase to train and run these models
  1. 2.7 Project Partners and External Funding

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

The project is undertaken by NESO’s Frequency Risk and Modelling team (FRM) and the Smith Institute. Smith Institute will develop and deliver the models that generate predictions regionally, FRM will provide the relevant data, check the results against acceptance criteria and receive the developed models at agreed delivery points. No external funding support is required.

* 1. 2.8 Potential for New Learning

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

Until recently, reserves were set in a static way. The dynamic reserve setting project successfully looked at the benefits of changing to a dynamic reserve setting system and is already recommending savings that can be safely delivered. The constraints in the energy system will affect the practical use of the recommendations for DRS, and so extending the logic to regions will allow the recommendations to be more accurate and useful, both in terms of security and available savings. There is no tool that delivers this ability in NESO or more widely in the GB electricity system, although regional reserve setting is a feature of the electricity grid in Sweden. In Sweden, the imbalance of generation and demand over their existing regions has resulted in the emergence of locational marginal pricing and the associated change in electricity markets. These new ideas could lead to the development of future markets in GB.

A final report will be published on to the Smarter Networks Portal.

* 1. 2.9 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.

This is a small-scale project (12 months). Outputs from the project will help NESO to optimise the regional reserve setting.

* 1. 2.10 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.

The project will look at data from across the whole GB network

* 1. 2.11 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. 2.12 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).

£700,000

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).

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:

The project could lead to a need for lower reserve holdings, carbon emissions, and costs, creating better visibility of reserve requirements for the control room, and decrease unusable MW procured by balancing reserve service behind constraints..

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

Not applicable.

* 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)

Not applicable. ￼

* + 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 total cost for reserve in 2023 is around 200M and most of them resulted from the regional constraints. Using Regional Dynamic Reserve Setting could ensure that reserve is procured appropriately, mitigate the impacts of constraints on reserve, and further decrease the cost significantly. Consumers could also get the benefits of lower energy costs and lower carbon emissions.

* + 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.

The output of the model will be applicable to the whole GB grid as the model will be designed for NESO, The finding of the models and the method used to develop it may be useful for DSOs.

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

N/A

* 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 |  |
| A new methodology (including the identification of specific new procedures or techniques used to identify, select, process, and analyse information) | X |
| 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

Other operators of grid systems also have requirements to procure reserve in order to ensure that their system remains balanced and secure. They, like NESO, may also have challenges in terms of ensuring that the reserve procured is free from constraints and therefore able to be efficiently used, If the regional reserve setting models can be shown to be useful to NESO, it is likely that the approach used here may be applied in other localities.

* + 1. Or, please describe what specific challenge identified in the Network Licensee’s innovation strategy is being addressed by the Project (RIIO-1 only)

Not applicable.

* + 1. 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:

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

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

* 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.

The project has not been tried before because the facility to dynamically predict reserve requirements did not exist. Now that this facility does exist, the most obvious next step is to think about how reserve is procured regionally, as constraints affect how efficiently reserve can be used.

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

Until the completion of the first project, DRS, reserve was set in a more static way, through the analysis of historical data alone. The completion of DRS has shown that it is beneficial for NESO to take into account additional features that vary on a daily and even hourly basis, when procuring reserve. Now that the concept of dynamic reserve setting has been shown to be of use, it will be drawn into BAU. Since dynamic reserve setting is not yet part of business as usual, it follows that regional dynamic reserve setting is not a part of BAU either.

* + 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.

The TRL of the overall framework is relatively low; therefore, innovation funding is more suitable for exploring the project's potential and increasing the TRL before transferring into subsequent development. Also, conducting this project with NIA funding will ensure that the project findings can be shared more widely with other interested Network Licenses. There are increased risks associated with the availability of required data and a high level of assumptions, which makes this project better suited to NIA.

* 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.

Whilst there are other projects exploring innovative approaches to reserve setting, they are not prototyping a regional model of this complexity for the GB system.

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

Not applicable.

**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.*

A final report will be published on to the Smarter Networks Portal.

**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 <https://www.nationalgrideso.com/future-energy/innovation>
3. Via our managed mailbox [innovation@nationalgrideso.com](mailto:innovation@nationalgrideso.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** |  |