NIA Project Registration and PEA Document

July 2023

*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 Optimiser Transformation (DOT) |  | NIA2\_NGESO044 |
| Funding Licensee(s) |  | Project Start Date |
| National Grid Electricity System Operator |  | July 2023 |
| Nominated Project Contact(s) |  | Project Duration |
| Shaun Clohessy |  | 6 months |
| Contact Email Address |  | Project Budget |
| innovation@nationalgrideso.com |  | £750,000 |

**Project Summary (125 words limit)**

Great Britain’s energy landscape is changing at an increasing rate, not only in terms of how energy is generated and distributed but also in how it is used by consumers. This increases the complexity for grid operators in forecasting power system conditions and in developing dispatch control strategies that can utilise more distributed intermittent renewable resources whilst retaining the reliability of supply required. Traditional dispatch tools and processes are becoming increasingly insufficient and cannot take advantage of the advancement of digital technologies such as Artificial Intelligence and Machine Learning. This project builds upon work undertaken in NIA2\_NGESO0013 Advance Dispatch Optimisation and will design a blueprint for transformation of control room tools and processes to meet the System Operator needs of the future.

**Benefits Summary (125 words limit)**

Multiple benefits can be realised from the delivery of this project:

Short Term Benefits

* Identification of the detailed requirements for the system components and adaptive input models
* Development of the sequencing required to deliver a control room dispatch optimiser tool capable of assessing the multiple operational scenarios inclusion of distributed intermittent renewable resources present.

Longer Term Benefits

* Optimised forecasting and dispatch by leveraging flexible demand and storage technologies reducing Balancing Mechanism (BM) costs
* Management of increasingly complex grid operations through utilising adaptive input models and machine learning. ​
* Improved performance monitoring, evaluation and feedback of the system through machine learning and operator education.
* Improved operator situational awareness through the use of multi-dimensional visualisation tools utilising highly accurate input data, probabilistic trajectories, input scenario information, optimisation results and scenarios.

**Lead Sector**

|  |  |
| --- | --- |
| Electricity Distribution | Gas Distribution |
| Electricity Transmission | 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 |
| 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 | Optimised assets and practices |
| Flexibility and Commercial Evolution | Whole Energy System |
| Consumer Vulnerability | Data and Digitalisation  |

**Development steps**

|  |  |
| --- | --- |
| Technology Readiness Level (TRL) at Start 2 | TRL at Completion3 |

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.

As the energy transition continues, more distributed intermittent renewable resources, many with integrated storage, will continue to be connected to the grid and more distributed technologies such as smart home controls and EV charging will continue to alter consumer behaviour. This trend will continue to create increasing uncertainty for grid operators in forecasting power system conditions, predicting which hours of the operating day will be most challenging and in developing dispatch control strategies to efficiently manage grid operations in a reliable manner.

As this uncertainty increases, traditional dispatch tools and processes will become increasingly insufficient and transformational revision of tools and processes is recommended. This project will build upon the feasibility study carried out in NIA2\_NGESO0013 Advance Dispatch Optimisation and produce a detailed gap analysis of potential future innovation projects required to enable the Advanced Dispatch Optimiser (ADO) to be built.

* 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.

This project brings together a team of experienced subject matter experts from the ESO and IBM, with significant technical experience in dispatch operations and ENCC systems, expertise in planning and delivering technical/IT work programmes and expertise in markets and associated reform work. They will work in close collaboration to deliver an end vision for the ADO programme with a detailed gap analysis and roadmap for how ADO will be built, whilst integrating with ESO’s BAU systems and formalised business plan. A breakdown of the work packages is listed below:

**WP1: Deep Dive: Adaptive Input Data Models**

**Aim:** The project will review and conduct a deep dive on the adaptive input data model groups defined in NIA2\_NGESO0013 Advance Dispatch Optimisation, these are:

1. Net Demand
2. Distributed Energy Resources (DER)
3. Transmission
4. Generation
5. Interconnectors

For each model the project will:

* Analyse what input data is needed to create and run the model.
* Identify what data currently exists, where it comes from, and investigate the feasibility of this data continuing to be source as it currently is.
* For data that doesn’t exist, draft a specific plan to define how it could be created or sourced, and consider some mitigations for the eventuality that the data needed cannot be created or sourced.
* Consider possible transformations in a transformation model.
* Evaluate data quality and investigate how data uncertainty could be addressed.
* Understand and define what next steps would need to be taken to develop the adaptive models

**WP1 Outputs**

* Data model report describing all five data models with the next level of detail regarding input, transformation, and output

**WP2: Gap analysis of projects addressing ADO scope**

**Aim:** The project will analyse which project/initiatives the ESO has already launched or are part of Business Plan (BP) commitments, that address the end state of ADO described in NIA2\_NGESO0013 Advance Dispatch Optimisation. The goals are to:

* Undertake assessment of existing BAU systems
* Undertake assessment of BP commitments
* Identify gaps between BAU+BP and ADO vision that would still need to be resolved
* Challenge the suggested timeline and advise on which modules might be particularly challenging and should be trialled, e.g., as part of further Innovation as they need special attention
* Crosscheck updates in technology since the report for ADO was written
* Estimate order of magnitude of cost to complete gap filling work based on complexity of the capability

**WP2 Outputs**

* Capability Framework with a clear view of the current status of each required capability
* Benefit analyses for each capability
* Requirements / technical capabilities backlog
* Detailed gap analysis report with sufficient detail to initiate procurement of identified activities

**WP3: Conceptual Architecture**

**Aim:** The architecture should consider all relevant projects already running, that address ADO scope and consider the pieces of work still missing. Key questions:

* How do we connect the modules?
* How do we ensure the ability to plug modules in and out?
* Pros and cons of a distributed versus a centralised architecture approach
* How to achieve high security and high availability efficiently

**WP3 Outputs**

* Architecture views detailing system context, data sources and interfaces, to best enable flexibility, security and availability

In line with the ENA’s ENIP document, the risk rating is as follows:

* TRL Steps = 1 (2 TRL steps)
* Cost = 2 - £750k (£500k - £1m)
* Suppliers = 1 (1 suppliers)
* Data Assumptions = 2
* Total = 6 (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 project will last approximately 6 months with one project partner.IBM working alongside the ESO and Industry SMEs will develop the detailed data model report, gap analysis report, the iterative plan and architectural views.

* 1. Objectives

This cannot be changed once registered.

The objectives are as follows:

* Utilising reports from the original ADO project and SME input to define clearly what ADO will build and how.
* Identify gaps in the planned infrastructure and suggest specific projects to address gaps.
* Identify wider factors or risks that could impact the delivery of the ADO vision and define mitigating actions.
* Develop an agile delivery plan that can be integrated with BAU and existing business plans.
	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 ESO 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 below.

* 1. Success Criteria

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

The following will be considered when assessing whether the project is successful:

* The Data Model report will be produced defining the type, source and quality of data required to be able to run the models.
* The gap analysis will identify the gaps in capability and provide sufficient detail to initiate activity to address missing capabilities.
* The iterative plan will be utilised as a blueprint for the ADO programme.
* Stakeholders across the ESO will have awareness of the approach to deliver ADO and be engaged in the project.
* The project delivers against objectives, timescales and budgets as defined in the proposal
	1. Project Partners and External Funding

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

IBM will be carrying out the work. No external funding is required.

* 1. Potential for New Learning

Details of what the parties expect to learn and how the learning will be disseminated. The project will identify what input datasets are required to run the adaptive models, where this can be sourced now and in the future. The project will identify the most efficient sequence for building the optimiser components, and how best to connect the sub systems to enable flexibility, security and availability.

Finally, the project will learn what market rules need to be in place to best enable the use of the optimiser tool.

* 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.

The project spans six months with one project partner. The project consists of extensive stakeholder engagement with ESO SMEs and consultation with Google X and OEMs.

* 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.

Project will be based upon the GB ESO area of operation

* 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).

£750,000

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:

The project is an enabler for the Dispatch Optimiser Transformation programme which will increase the Control Room’s ability to be able to DERs and low carbon generation. Utilising a greater level of automation, machine learning and artificial intelligence the project will reduce BM costs whilst improving the management of an increasingly complex grid operation landscape as we transition to a zero carbon energy system.

* + 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)

* + 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.

There are multiple benefits that can be realised from the delivery of this project:

**Short Term:**

* Identification of the detailed requirements for the system components and adaptive input models
* Development of the sequencing required to deliver a control room dispatch optimiser tool capable of assessing the multiple operational scenarios inclusion of distributed intermittent renewable resources present.

**Longer Term Benefits**

* Optimised forecasting and dispatch by leveraging flexible demand and storage technologies reducing rising BM costs. To give an understanding of scale, the forecast balancing costs for financial year 2023/24 are estimated to be £3,500m (forecast published June 22).If we assume modest efficiencies are achieved through optimised dispatch, there is the potential for significant financial savings.
* Management of increasingly complex grid operations through utilising adaptive input models and machine learning. ​
* Improved performance monitoring, evaluation and feedback of the system through machine learning and operator education.
* Improved operator situational awareness through the use of multi-dimensional visualisation tools utilising highly accurate input data, probabilistic trajectories, input scenario information, optimisation results and scenarios.
	+ 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.

This project will outline the roadmap to develop ADO, a tool which will be applicable for the whole of the GB network

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

At this stage the costs are unknown for rolling out the outputs to deliver ADO going forwards, the roadmap developed within this project is the first step to realising the potential delivery of these tools.

* 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  | Y |
| 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 | Y |
| 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

Reports and key learnings from the project will be disseminated with relevant industry stakeholders following project completion.

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

N/A

* + 1. Is the default intellectual Property Rights (IPR) position being applied?

This cannot be changed once registered.

|  |  |
| --- | --- |
| YesX | 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.

The project will develop a plan to deliver a world first dispatch optimisation tool that incorporates fit-for-purpose BAU systems, planned business change enhancements and new capabilities using state-of-the-art technologies such as AI and ML. The forward-looking time coupled optimisation model has been deployed at several grid operators, but the functionality has been limited to generation. There is no implementation of such an approach that manages optimisation of limited energy resources in a time-coupled manner.

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

The Project goes beyond what is planned in BAU for Balancing Transformation. This project is investigating and developing the roadmap and optimisation tools needed to change how the ESO control room operates the whole electricity system and therefore falls outside of BAU activities

* + 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 project will develop a plan to deliver a world first dispatch optimisation tool that incorporates fit-for-purpose BAU systems, planned business change enhancements and new capabilities using state-of-the-art technologies such as AI and ML.

The modelling approaches for the Adaptive Distributed Energy Resource model, Adaptive Interconnector model and Adaptive Demand models have not been implemented by a Grid Operator before.

The forward-looking time coupled optimisation model has been deployed at several grid operators, but the functionality has been limited to generation. There is no implementation of such an approach that manages optimisation of limited energy resources in a time-coupled manner.

* 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 scope of Dispatch Optimiser Transformation is to develop an integrated roadmap ensuring existing business plans are combined with the DOT requirements to deliver an end state vision. This work builds upon the results of the NIA2\_NGESO0013 Advance Dispatch Optimisation project.

* + 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 will be generated from the project:

* Data model report
* Capability framework
* Detailed gap analysis report
* Impact assessment document
* A conceptual architecture

**Data Access Details** *(standard ESO 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’. National Grid ESO 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

Details on the terms on which such data will be made available by National Grid ESO 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** |  |