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

Sep 2023

Project Reference Number

NIA2_NGESO057

Project Registration

Project Title

Alternative Metering (Baselines)

Project Reference Number

NIA2_NGESO057

Project Licensee(s)

National Energy System Operator

Project Start

September 2023

Project Duration

0 years and 7 months

Nominated Project Contact(s)

Gus Clunies-Ross

Project Budget

£400,000.00

Summary

Currently there are a significant number of assets which are not able to participate in Frequency Response services due to challenges in clearly demonstrating frequency response delivery separate from the delivery of other services. This means there is less competition in the markets and as a result the cost paid for response services is higher than it could be if these assets were able to participate.

This project will investigate analysis techniques and develop an algorithm to validate Response delivery from a large number of these assets which are unable to use conventional metering solutions.

This should enable service providers to participate in Dynamic Response markets with assets using forms of data processing to separate out dynamic response service delivery from other energy recorded by the meter.

Third Party Collaborators

The Smith Institute

Nominated Contact Email Address(es)

box.so.innovation@nationalgrid.com

Problem Being Solved

Currently there are a significant number of assets unable to participate in Frequency Response services due to challenges in clearly demonstrating frequency response delivery separate from the delivery of other services. This means there is less competition in the markets and as a result the cost paid for response services is higher than it could be if these assets were able to participate.

As the electricity system transitions to use increasingly renewable sources of energy inertia on the system will drop and, as a result, there will be additional frequency volatility. Frequency response services are the ESOs primary mechanism for managing this additional volatility and so it is expected the requirement for volumes of assets providing these services will increase with time. Whilst there are a considerable number of new response-capable assets planned, there is a significant constraint in the connection dates available.

The aim of this project is to provide opportunities for more efficient usage of existing response-capable assets which should allow assets to bid at lower prices and therefore reduce the balancing costs passed to consumers. It would also provide additional volumes to the market and reduce our reliance on connection dates for new assets.

Method(s)

This project will consist of three Work Packages (WPs) starting with a review of theoretical analysis methods through to the development and delivery of a monitoring algorithm:

- WP1: determining available data sources such as historical records of real-time and post-delivery metering of Frequency Response delivery as potential algorithm inputs and agreeing the format of data outputs to ensure it will be deliverable in to the existing ESO performance monitoring system.

- WP2: research of analysis techniques and how they can be combined in an efficient and accurate algorithmic model.
- WP3: writing the code for a Proof-of-Concept (PoC) model to allow the operation of the algorithm on ESO systems to validate test data from industry participants in their development of data derived metering solutions.

This project will develop methodology to detect manipulation in response data profiles submitted under a new proposed provision of flexibility service. As the new provision is not yet live, available response profile data is not directly applicable. Instead, it will form the basis for crafting a synthetic data generation algorithm.

Of importance will be to synthesise data that reflects expected day-to-day variability and errors in measurement and reporting. That is, our solution must be robust to anticipated data quality when productionised and deployed. We will be guided in this by quantifying variability in current available data. A schema for generated data will be defined as part of scoping the synthetic data generator itself.

It is expected that data used as the basis for qualitatively or quantitatively building a synthetic data generator will comprise response profiles originating from the ESO. Thus data quality will be assured by its unified and single-source nature. Any missing data will be filled by an appropriate imputation scheme as part of pre-processing.

Finally, in developing the manipulation detection algorithm, we will be mindful of the potential for error in its conclusion. To mitigate this, it will not conclude a binary yes/no; rather, a level of risk will be reported, allowing for natural variability in the data and resultant grey areas where expert judgement can then be applied.

In line with the ENA's ENIP document, the risk rating is scored Low.
TRL Steps = 2 (5 TRL steps)
Cost = 1 (£400k)
Suppliers = 1 (1 supplier)
Data Assumptions = 2 (Assumptions known but will be defined within project)
Total = 6 (Low)

Scope

This project will focus on reviewing the theoretical options and developing suitable ones into a usable PoC algorithm which can be implemented as a Minimum Viable Product (MVP) to begin trials for provider generated operational delivery data.

The final deliverable will be the development and coding of the chosen algorithmic model in a suitable format and language for delivery in to the existing ESO performance monitoring systems to allow external submission trials to begin.

The algorithm should use metered data, possibly combined with historical delivery data to output a score indicating the probability of manipulation. The algorithm must also be calibrated to set an appropriate threshold for the score to suggest if further investigation should be conducted

WP1: Scoping
Workshops will be undertaken to generate a process map indicating: the data sources available; any short- and long-term outputs likely generated by the analysis algorithm that will require presentation or storage; and interoperation of data streams with the algorithm itself.

WP2: Solution identification
There are several possible algorithmic avenues to quantify baseline legitimacy. With scope and data availability known, one or more suitable approaches will be designed based on mathematical analysis and machine learning.

Solutions could include:

- Direct correlation analysis between submitted baseline and response
- Unit capability and service attribution
- Time series analysis
- Hybrid methodology

WP3: Implementation and evaluation
Following design agreement, the chosen solution will be delivered as end-to-end demonstration scripts. These will clearly show both pre-training on historic data, if applicable to the selected methodology, and the regular assessment process. This will initially be deployed as a proof of concept but could be expanded to a full production solution.

If a successful solution is developed, the ESO IT teams will undertake the delivery and testing required for implementation on the IT systems, upon completion of the project.

If there is a successful solution developed, found then, following the conclusion of this Innovation project, internal If appropriate, this will be progressed through to the live data analytics platform system to complement the existing data analysis tools.

Objective(s)

- Validate metering data from service providers to ensure that submitted data has not been falsified
- Develop a PoC algorithm which can be implemented as an MVP to start accepting trials for provider generated operational delivery data
- Develop the chosen algorithmic model in a suitable format and language for delivery into the existing performance monitoring systems to allow external submission trials to begin.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

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.

Success Criteria

The primary success criteria for the project will be the creation of an algorithm in line with the objectives which can reliably detect falsification in synthetic frequency Response metering data to allow trials to be conducted with participants using proposed methodologies for data derived metering.

Project Partners and External Funding

Project partner: Smith Institute, no external funding contribution.

Potential for New Learning

It is expected that the analysis output of the project and the algorithm should provide insight into service provider behaviours and asset usage. This information will be confidential and will be used internally by the ESO and as part of individual conversations with market participants.

More generally the project should provide valuable insight into algorithmic monitoring techniques and an opportunity to explore the potential for algorithmic analysis and monitoring of service delivery. This learning will be disseminated through a project report and industry conferences if applicable.

Scale of Project

This project will span seven months with the Smith Institute delivering the analysis and algorithm. This timeline is considered to be the minimum viable to achieve the scope of work required to provide confidence in the effectiveness of the analysis and algorithm.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

The scope of the project will cover the whole GB system.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£400,000

Project Eligibility Assessment Part 1

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:

How the Project has the potential to facilitate the energy system transition:

This project is expected to provide a route to market for significant volumes of existing assets which can be used to provide frequency response services required to support a zero-carbon electricity system. Without these assets additional volume requirements would need to be met by new assets connecting to the system which are experiencing delays in connection dates. A lack of cost-effective volume in these markets would present a significant barrier to our net zero energy transition.

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 (RIIO-1 projects only)

N/A

Please provide a calculation of the expected benefits the Solution

If the project is successful, and the method developed is approved to be delivered as a full production deployment, a financial benefit should be realised. The level of financial benefit realised will depend on the proportion of units which are currently excluded due to their baselines that could use this new methodology and the rate of uptake from these units.

The potential volumes, have been estimated at 443MW initially, rising to approximately 1GW in the next couple of years. This would represent approximately 20% and 40% of our current requirement respectively. The value of the overall Response markets does vary significantly but in the months April-June 2023 the spend was approximately £20mn/month.

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

The scope of the project will cover the whole GB Response market (Dynamic Containment, Dynamic Moderation, Dynamic Regulation), and therefore no replication will be required.

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

As above the scope of the project will cover the whole GB Response market (DC, DM, DR), and so will not need to be replicated across GB.

Requirement 3 / 1

Involve Research, Development or Demonstration

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 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

RIIO-2 Projects

☐ 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

Learnings from this project in the form of discovery of complexity, adaptability and specific monitoring techniques can be applied to other delivery validation projects. This learning will be disseminated through a project report and industry conferences if applicable.

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

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.

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

No existing solutions have been identified for creating or validating similar data derived metering options, either in GB markets or in other markets or industries.

There have been discussions of options internally within the ESO and with members of industry as to how this data could be generated and validated. No existing options have been highlighted from engagement with internal or external parties interested or focussed on this area of monitoring.

The ESO Power Responsive project looking at aggregated metering requirement for participation in BM to provide a route to market for aggregated assets and requirements for metering standards. These may result in reform in similar areas but would not address the same concerns and the approach is entirely different.

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

Increasing numbers of behind the meter assets mean that there are new opportunities for creating previously unviable routes to market. The analysis must consider a number of different methodologies for validating baseline data as this is an entirely new application for algorithmic analysis. There is a risk that the analysis may find that there are no options which delivers the project requirements meaning there is no option to improve on the existing process

Similar solutions have not been found in GB or internationally.

Relevant Foreground IPR

A final report will be produced, which will capture the learnings generated on analysis techniques, and this will be published for the industry to use.

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 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 the ESO Data Portal at https://data.nationalgrideso.com/
4. 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.

Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

The quality of the solution and likelihood of success will be closely linked to the experience and knowledge of the project team in conventional baseline analysis.

The ESO is not equipped to undertake this analysis to the level required for the project delivery as part of BAU activities.

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

- There is the potential that no viable solution will be found as no similar projects have been undertaken globally which makes this project better suited to NIA.
- The starting TRL is low. Therefore, innovation funding is more suitable for exploring the project's potential and increasing the TRL before transferring into BAU activities.
- Conducting this project with NIA funding will ensure that the project findings can be shared more widely with other interested network licensees. Learnings from this project in the form of discovery of complexity, adaptability and specific monitoring techniques can be applied to other delivery validation projects.

This project has been approved by a senior member of staff

☑ Yes