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

Jun 2021

Project Reference Number

NIA2_NGESO005

Project Registration

Project Title

Stability Market Design

Project Reference Number

NIA2_NGESO005

Project Licensee(s)

National Energy System Operator

Project Start

June 2021

Project Duration

0 years and 7 months

Nominated Project Contact(s)

Sophie Van Caloen

Project Budget

£300,000.00

Summary

Traditionally synchronous generation has provided stability requirements (inertia, Short Circuit Level & reactive power support) as a natural by-product. As more non-synchronous generation enters the system, the ESO needs alternative sources of stability.

Stability pathfinders allow us to test procurement approaches for long term stability requirements, but the ESO still rely on the dispatch of synchronous generation in the Balancing Mechanism to ensure stability. The development of a stability market could offer the ESO a route to access stability services through an open, transparent and competitive market.

This project will consider current stability arrangements and investigate the best option for an end-to-end stability market. This could allow the ESO to start to develop a stability market and best optimise long term and short-term stability procurement.

Third Party Collaborators

AFRY Management Consulting Ltd

Nominated Contact Email Address(es)

box.so.innovation@nationalgrid.com

Problem Being Solved

Traditionally synchronous generation has provided stability requirements (inertia, Short Circuit Level & reactive power support) as a

natural by-product. As more non-synchronous generation enters the system, the ESO needs to find other sources of stability.

Inertia level changes all the time but the estimated annual average national inertia level provided by the market in 2020 is 197GVA.s and this is expected to decline in the future. Short circuit level and dynamic voltage support also varies by location (https://www.nationalgrideso.com/document/188666/download).

The ESO operates with a minimum inertia level of 140GVA.s. The inertia level is currently being managed through market dispatch, using the Balancing Mechanism to add synchronous units to the network.

The stability pathfinders (https://www.nationalgrideso.com/future-of-energy/projects/pathfinders/stability) are helping to address this operational need and testing tender approaches by awarding contracts for up to 6 years to units who can provide these stability products. Developing a stability market could offer the ESO a route to access stability services through an open, transparent and competitive market, whilst also investigating the best mix of long term and short-term stability product.

Method(s)

This project will be a desk-based study run by AFRY with input from the ESO and wider stakeholders.

The project will:

- Set the scene by understanding the future world then review and describe the existing arrangements for stability. This will help in identifying future needs for a stability market.
- Define objectives, assessment criteria and constraints. Those will be used in the evaluation of the different market design options.
- Using a “building blocks” approach, collate them into ‘straw man’ design options and develop detailed end-to-end designs.
- Assess the different market design options against the assessment criteria - the assessment will rely on worked examples and be qualitative or include some form of quantification.
- Recommend a stability market design.

Stakeholders will be able to input in this project through various workshops and a questionnaire. Engagement will take place at different stages of this project to gather feedback on the different options, the assessment, etc.

Future potential projects might also analyse further the interactions between the stability market and other markets (e.g. reactive, response).

Scope

The overall scope of the project is to create options for the delivery of a stability market for GB, assessing these options and recommending one stability market design.

Operational costs arise due to the management of stability levels. Inertia has traditionally been available as a by-product through market despatch of synchronous generation in the Balancing Mechanism. Additional operational cost has also been seen from constraints caused by low short circuit levels.

In stability pathfinder phase one the ESO spent £328 million on 12. 5GVA.s for services delivering between 2020 and 2026. (https://www.nationalgrideso.com/future-of-energy/projects/pathfinders/stability)

The introduction of a market for stability will create competition which should lead to lower prices for end consumers. It will create an additional revenue stream for providers as well as a more transparent, open process. It is also expected to enhance the security of the system. Because no such market exists, the ESO can’t fully assess the potential cost reduction, but this research project will evaluate the potential benefits.

Currently traditional fossil fuel plant provides a lot of the stability services. The ESO aims to create a market which allows all sources to compete in the provision of stability to the network. This will enable providers to access to an additional revenue stream which will also enhance the business case for renewable generation.

Objective(s)

The objective of this project is to recommend a market design for stability. The project will first understand the current stability situation in the GB market, then create different options for a stability market, assess those options and choose a preferred one.

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

A recommendation for an end-to-end design for a stability market, backed up with an assessment of different options.

Project Partners and External Funding

Project Partner: AFRY, no external funding contribution

Potential for New Learning

As a world first the ESO expect that all the information to come out of the project to be new learnings but specifically:

- Assessment of current situation of stability management
- Different options for the design a stability market
- Potential benefits of a stability market

Scale of Project

This project will span 5 months with AFRY delivering the work (as well as additional stakeholder engagement)

This is a project to scope the different potential stability market design options and so is small in scope.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

This project will cover the whole of the GB network. Aspects of the design may, however, be locational.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

Total: £300k

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:

Stability has traditionally been available as a by-product of synchronous generation. As ESO transition to net zero-carbon, the proportion of synchronous generation will decrease. The creation of a stability market will allow the ESO to procure the stability products it requires through an open and transparent process where all providers could compete.

How the Project has potential to benefit consumer in vulnerable situations:

Not required.

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)

Not required.

Please provide a calculation of the expected benefits the Solution

Not required as a research project.

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

This will be the output of the project. The scope of the project will cover the whole GB system.

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

The cost to rollout will be dependent on the final option chosen.

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

The project will assess different options for a stability market and recommend one end-to-end stability market design. The ESO will benefit from the stability market assessment and this could be used in the future procurement of stability products. The results and the main learnings of the study will also be shared with the industry.

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

Not required.

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.

We believe this project is a first and as such there should be no direct duplication.

There is currently a Pathfinder project to procure long term stability, testing the procurement of stability services but with a timescale of 6 years.

At the outcome of this innovation project analysis and options, the ESO will feed any relevant findings into the Pathfinders project for testing in a real-world setting. The exact nature of what will feed in will be dependent on what the analysis reveals and the stage at which each pathfinder phase is in their procurement.

There are a number of innovation projects which have synergies which ESO will be mindful of but no direct overlaps.

- A similar RFI has been sent out for a Reactive Power Market Design, with the aim of this being developed into a NIA proposal. There may be learnings which can be shared between both projects, especially as work is likely to progress on both in parallel.

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

Not required.

Additional Governance And Document Upload

Please identify why the project is innovative and has not been tried before

A market of this type has never been attempted before and as such there is limited research on the specific options for delivery. This is required due to an increasing requirement for stability services and as such hasn't been needed previously.

Relevant Foreground IPR

The main deliverable from this project is a report detailing the end-to-end market design options

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:

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 already publishes much of the data arising from our innovation projects here so you may wish to check this website before making an application.
Via our Innovation website at https://www.nationalgrideso.com/future-energy/innovation
Via our managed mailbox box.SO.innovation@nationalgrid.com

Details on the terms on which such data will be made available by National Grid Gas Transmission 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 need for other balancing services, such as the procurement of stability, has been identified as a need within our RIIO-2 business plan and the existing Pathfinders allow us to test different procurement approaches. However, this project will be researching and developing a novel approach to addressing the issue of system stability and investigating the potential different options. This type of market does not yet exist anywhere.

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

Commercial risk: the project will develop stability market design options, as this type of stability market does not exist elsewhere. Without researching and assessing those options, there is a significant risk of developing an inefficient market. Stakeholder will be able to provide feedback through the process. Without this work, there is a significant risk that the procurement of stability will be more costly.

This project has been approved by a senior member of staff

☑ Yes