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## NIA Project Close Down Report Document

### Date of Submission

Sep 2023

### Project Reference Number

NIA2\_NGESO005

## Project Progress

### Project Title

Stability Market Design

### Project Reference Number

NIA2\_NGESO005

### Funding Licensee(s)

NG ESO - National Grid ESO

### Project Start Date

June 2021

### Project Duration

2 years and 3 months

### Nominated Project Contact(s)

Edward Farley

## 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.

## Objectives

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.

## Success Criteria

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

## Performance Compared to the Original Project Aims, Objectives and Success Criteria

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### Project overview

The project recommended a high-level stability market design. The report of the project has been published [here](#) and includes a description of the case for change, the objective framework, an assessment of market options and a description of the recommended market design. This is aligned with the initial objective of this project.

The Stability Market Design Phase 2 work (started in July 2022) has built on the initial findings from the first phase of this project (concluded March 2022) and recommends three specific stability markets – long-term (Y-4), mid-term (Y-1), and short-term (D-1). Following the initial recommendations in Phase 1 to have a blend of long- and short-term procurement, a range of options were considered in Phase 2 from which the three specific timescales referenced were recommended. Each market has a distinct purpose and role in accelerating long-term investment and improving security/reducing cost in the short-term as we transition to a net zero power sector.

### Phase 1 Project activities

WP1: Alignment, vision, objectives (Completed)

- Scene setting: What are the realities? Establish ‘givens’ and make assumptions on all relevant topics
- Objectives: What do we want to achieve? Establish the design principles for the market

WP2: Design elements, strengths, weaknesses (Completed)

- Market building blocks: Define the key design choices that can materially impact market outcomes
- Straw-man options: Define conceptual design options to assess – exploring alternative philosophies
- Assessment: Appraise design options qualitatively against objectives
- Assessment: Appraise design options quantitatively

WP3: Industry views, refinement, finalisation (Completed)

- Refinement: Highlight the preferred option; make improvements to increase performance against our objectives
- NIA desirable option: Recommend a desirable design for stability market and way forward

### Phase 2 Project activities

WP1: Key design questions (Completed)

- Key considerations for Transmission Owner (TO) assets and how they participate in the LT market
- Enforcing eligibility criteria for LT and ST markets

WP2: Further eligibility and contract design questions (Completed)

- Approach to depreciating assets in the LT market
- Participation routes for OFTO’s, Interconnectors, regulated assets and existing pathfinder units
- Contract duration and granularity across all stability markets

WP3: Procurement strategy (Completed)

- Bid and payment structure for participating in stability markets
- Stacking rules for stability with other products
- ESO strategy for procuring stability across all different markets

Stakeholder engagement was carried out and fed into the assessment. Two industry webinars were held to share initial findings and seek feedback (recording available [here](#)). A survey was also conducted to gather information and evidence from industry such as technology costs, investment issues, lead times, interaction with other services, cost structures, decision-making in dispatch timeframes.

Stakeholder engagement continued throughout Phase 2. An industry expert group was formed based on a voluntary request from the ESO for interested parties to come forward. The Expert Group (comprising c.15 participants) was set up with representatives from generators (renewable and non-renewable), storage, manufacturers, consultants, Ofgem and TOs. This group has met on four occasions throughout the duration of the innovation project (minutes [here](#)) and provided valuable feedback and insight into our market design elements. Several surveys were also conducted to gather information and evidence from industry such as technology costs, investment issues, lead times, interaction with other services, cost structures and eligibility considerations.

An industry webinar was held at the end of the project to conclude the project findings, seek feedback and share key messages with the whole of industry who may not have been involved in as much detail via the Expert Group. Over 180 market participants joined this webinar which demonstrates a significant interest in the outcomes of this project. The slides, recording and a Q&A document for this webinar are published on the [ESO's Stability Market Design webpages](#).

## Required Modifications to the Planned Approach During the Course of the Project

A second phase of the project was approved in 2022 to answer more detailed questions around eligibility, contract structure and procurement. Phase 2 consisted of three WPs: 1) Key design questions 2) Further eligibility and contract design questions and 3) Procurement strategy. In order to complete Phase 2, the project timeline was extended to 1 year and 11 months and the project costs were increased to £706,755. The addition of a second phase also progressed the project TRL further than the original plan (TRL 4) with the ST market research at TRL 6 and the MT and LT markets at TRL 5.

The modelling plan was changed to enable the modelling of three Future Energy Scenarios (FES) for two years. The possibility to change and increase the modelling was foreseen as an optional work package modification of the initial scope. The modelling of three scenarios enabled us to test our recommendation within a wider range of future energy systems and therefore improve the robustness of our conclusion.

## Lessons Learnt for Future Projects

The core recommendation of the Stability Market Design innovation project is to develop a combination of a dedicated short-term market (day-ahead) with a long-term market (building on the well-functioning pathfinder approach) for stability services, while retaining the Balancing Mechanism (BM) option as a backstop.

Other key recommendations:

- Future arrangements should target and facilitate a diverse mixture of different technologies to provide stability solutions at least cost to consumers.
- An enduring solution is required so that participants are able to optimise their asset stability characteristics in the design phase against expected stability revenues.
- Long term procurement should continue and be formalised into a systematic process so that providers are given the opportunity to develop a pipeline of solutions. Efficient signals for investment planning must be in place.
- The addition of a short-term market would offer a route for providers that aren't able to make long term commitments and is expected to bring benefits in terms of dispatch efficiency and carbon reduction.
- Contract types should (initially) be simple to promote transparency and reduce complexity of solution value assessments. We are proposing a single duration & definition contract at each market timeframe to help manage complexity.
- We are proposing different eligibility in different timeframes. Long term multi-year contracts to underpin investment, year-long (T-1) contracts to manage forecast error and influence closure decisions, and short-term day-ahead contracts to fine tune positions and broaden the pool of potential providers – lowering barriers to entry and promoting competition.

Further research topics regarding the more detailed development and design questions could include:

- Exploring the interactions between stability and other services, such as voltage and frequency response.
- Refining some of the market design options, as well as our procurement strategy including:
  - Which providers should be eligible for participation and payment?

- What would be the volume split between the long-and-short-term markets?
- What is the optimal contract duration for a long-term market?
- A thorough cost benefit analysis with an expanded modelling horizon beyond 2030.

## **Phase 2:**

The core recommendation of the Stability Market Design innovation project (phases 1 and 2) is to develop three specific stability markets – long-term (Y-4), mid-term (Y-1) and short-term (D-1) – to meet stability needs cost effectively and aid the transition to a net zero power system. In parallel with these markets, the ESO retains the Balancing Mechanism (BM) option as a backstop alternative to increase system stability.

Other key recommendations:

- Market arrangements should facilitate a diverse mixture of different technologies to provide stability solutions at least cost to consumers and provide the appropriate signals for investment.
- The long-term market will be formalised into a systematic process, building on the success of Stability Pathfinders, so that providers are given the opportunity to develop a pipeline of solutions. Efficient signals for investment planning must be in place, as well as a clear view of long-term requirements from the ESO which will be enhanced through the Centralised Strategic Network Plan. It is recommended that the Transmission Owners are invited to participate in long-term stability markets via a counterfactual route which maintains TO's competitive access to financing large infrastructure projects. To minimise the effects of depreciating TO assets against the commercial provider, the ESO propose to extend long-term contracts as far as practicable (e.g., beyond 10 years) to reduce the impact which residual value may have on the assessment. In the long-term market, there is also a consideration for shorter-duration contracts (3 years) to advance the refurbishment of existing plant which is not viable in Y-1 timescales but does not qualify for 10+ year agreements.
- The mid-term market will provide an enduring route to market for new and existing assets to contract firmly for stability across a year (availability criteria apply). The Y-1 market will also provide an opportunity for current units contracted under stability pathfinders to extend the provision of their services in GB.
- The short-term market will offer a route to market for providers that would like to stack revenues at the day-ahead stage (e.g., storage, dispatchable non-dedicated assets). Short-term contracts will be aligned with other ancillary services, such as frequency response, and contract on an EFA block (4-hour) basis. Furthermore, the short-term market will allow the ESO to fine tune procurement for peak requirements when better information is available. In future, it will also open the opportunity for the ESO to co-optimize certain stability products (e.g., inertia) with response products (e.g., Dynamic Containment) which could deliver further cost savings to consumers.

Key lessons learnt also include:

- The value of engaging with industry in a small focus group
- The importance of market participants and the ESO being open and transparent about market design principles
- The benefits of applying innovation project thinking to real-environment examples – for example, this project progressed its thinking in parallel with the ESO reviewing the stability needs of the system.

Note: The following sections are only required for those projects which have been completed since 1st April 2013, or since the previous Project Progress information was reported.

## **The Outcomes of the Project**

This innovation project explored a potential enduring market design for the procurement of stability services. The primary objective of our stability market is to ensure cost-efficient provision of services needed to maintain system stability and security in the interests of consumers.

Stakeholder input was critical to shaping the case for change and informing decisions on key market design choices. We co-created with industry through industry webinars (available [here](#)) and a survey that allowed stakeholders to provide detailed views and feedback to design an effective market.

The recommendation for the enduring stability market design was developed based on a qualitative and quantitative assessment of different market design options. The analysis used AFRY's BID3 model and ESO's stability requirement analysis based on FES 2019 data.

The core recommendation of the Stability Market Design innovation project is to develop a combination of a dedicated short-term market (day-ahead) with a long-term market (building on the well-functioning pathfinder approach) for stability services, while retaining the BM option as a backstop. This approach combines the benefits of both the long- and short-term markets while mitigating the drawbacks of procurement in a single timeframe. This hybrid approach over multiple timeframes also aligns with stakeholders' feedback during our engagement, with the majority favouring a combination of short- and long-term markets.

Three distinct markets have been recommended following the completion of this innovation project. The long-term market will run at Y-4

stage and offer long-term (10+ years) contracts for the design and build of new solutions or major refurbishment. The mid-term market will be held at the Y-1 stage and aim to harness high-availability services in 1-year contract increments. The short-term market is intended to run at day-ahead to enable the ESO and market providers more flexibility closer to real-time. These outcomes are aligned with the initial objectives of this project to explore stability markets in more detail and recommend an implementation plan for starting to procure stability services.

As evidence of the value driven through this innovation project, the first stability market will be initiated in 2023. The mid-term Y-1 market is being developed as a priority to access stability from existing assets and to begin to signal to the market our commitment to procuring these services. This market will be repeated on an annual basis to access stability on a high-availability basis, reducing risk for the ESO and providing a strong incentive to the market with some certainty through a one-year contract. The day-ahead market will allow the ESO to procure any top-up capacity closer to real-time, but we believe that to stimulate the required investment, a Y-1 market with longer contract duration is more valuable as a first step.

## Data Access

Details on how network or consumption data arising in the course of NIA funded projects can be requested by interested parties, and the terms on which such data will be made available by National Grid can be found in our publicly available “Data sharing policy related to NIC/NIA projects” and [www.nationalgrideso.com/innovation](http://www.nationalgrideso.com/innovation).

National Grid Electricity System Operator already publishes much of the data arising from our NIC/NIA projects on the National Grid ESO Data Portal ([data.nationalgrideso.com](http://data.nationalgrideso.com)) and the Smarter Networks Portal ([www.smarternetworks.org](http://www.smarternetworks.org)). You may wish to check this website before making an application under this policy, in case the data which you are seeking has already been published.

## Foreground IPR

Reports and materials will be uploaded to the Smarter Networks Portal and are available on the ESO Stability Market Design webpage [here](#). This includes material from both Phase 1 and Phase 2 of the project. Further information on the Y-1 stability market will be available on the ESO website as it progresses.

## Planned Implementation

The ESO are actively implementing the mid-term Y-1 Stability Market as a priority with a Request for Information launching in Summer 2023. In parallel, detailed work is ongoing to understand both: a) the long-term requirements modelling and any further requirement for new-build procurement; and b) the design and implementation for a D-1 stability market in the ESO new auction and balancing systems. These will continue beyond the completion of this innovation project and new LT and ST stability markets will be launched in accordance with system needs and market liquidity.

## Other Comments

*The Project outcomes and results contain confidential information and intellectual property rights that cannot be disclosed in this Report due to their proprietary nature. Should the viewer of this Report (“Viewer”) require further details this may be provided on a case by case basis following consultation of all Publishers. In the event such further information is provided each and any Publisher that owns such confidential information or intellectual property rights shall be entitled to request the Viewer enter into terms that govern the sharing of such confidential information and/ or intellectual property rights including where appropriate formal licence terms or confidentiality provisions. Dependent upon the nature of such request the Publishers may be entitled to request a fee from the Viewer in respect of such confidential information or intellectual property rights.*

## Standards Documents

There may be updates required to Grid Code conditions building on the work done to provide a technical specification for grid-forming units via modification GC0137. Any other impacts on standards or codes will be closely monitored.