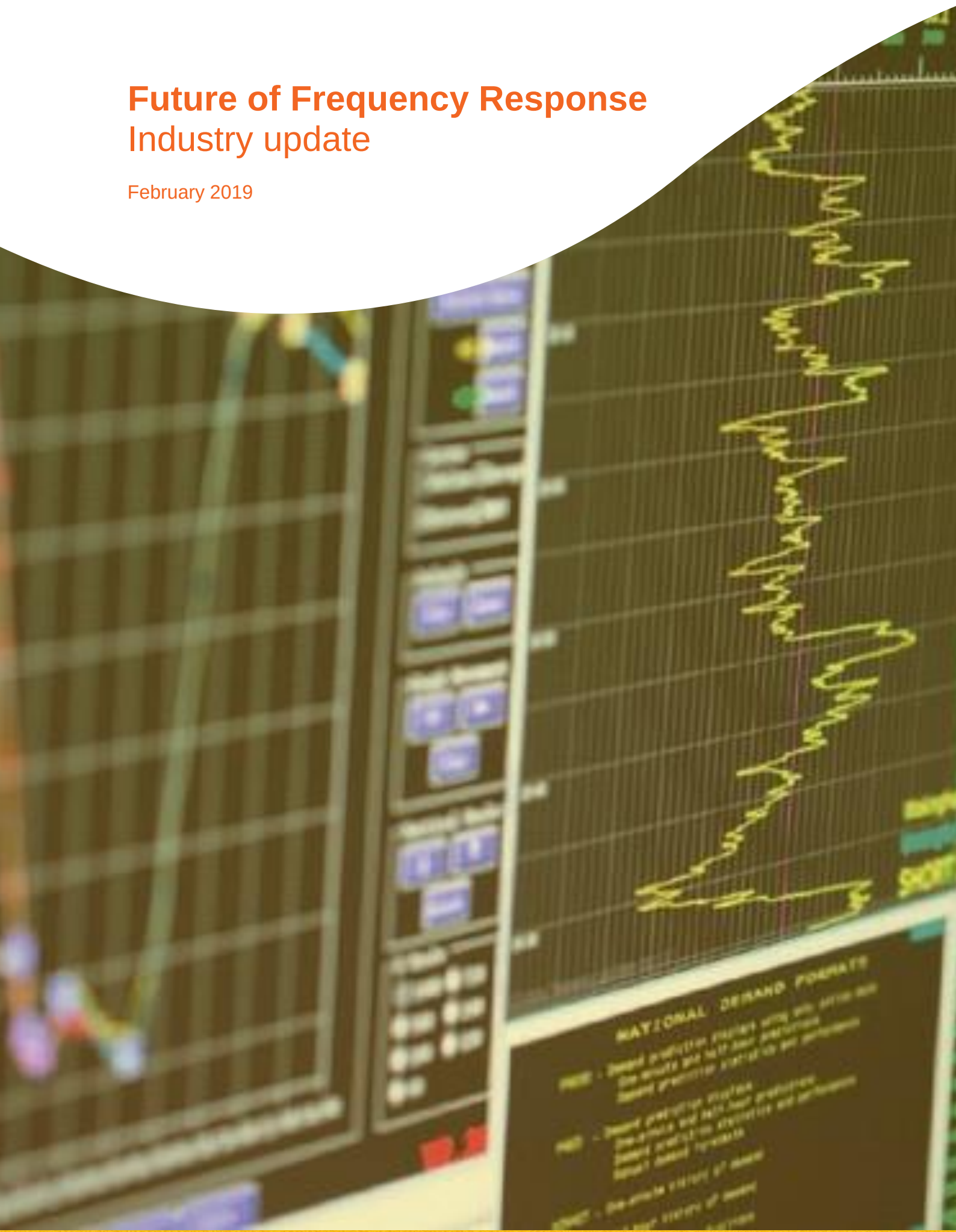
nationalgridESO

Future of Frequency Response
Industry update

February 2019



Introduction

Purpose of this document

The document brings together our latest work on the reform of frequency response markets to explain:

- The journey so far for the reform of frequency response, including our rationale for change, what's been achieved to date, how these deliverables interact and how stakeholder feedback has shaped our work.
- The latest developments for frequency response markets, including introducing our plans for weekly auctions and our proposals for a new frequency response product suite.
- Our future plans for upcoming deliverables and opportunities to engage.

Executive summary

As Great Britain transitions to a low carbon economy, system operation is becoming increasingly complex, and our provider base is becoming increasingly diverse. To meet future challenges of operating the electricity system and address issues raised by providers, we are in the process of reforming our balancing products and markets to make them more standard, more transparent and more easily accessible for all technologies.

We have implemented a number of changes to rationalise, simplify and improve our frequency response products, including retiring a number of now obsolete services, standardising our procurement windows, improving the transparency of market information and consulting on exclusivity clauses.

Two deliverables core to the reform of frequency response are our weekly auction trial (which will launch this Spring and facilitate the entry of providers with variable demand and generation), and our new frequency response products (to optimise the services we buy and improve how we manage the system). Both deliverables are key steps in ensuring equitable opportunities for all provider types).

The weekly auction trial will be launched in two phases. Phase 1 will commence in Spring 2019 and will procure one standardised version of our current Primary, Secondary and High Frequency Response service – low frequency static response . Phase 2 will procure all four standardised versions of our current products from Summer 2019 – low static, high static, low dynamic, high dynamic – which will enable us to procure in a more economic and efficient manner.

The new frequency response products that could replace our current product suite are introduced in this document and have been shaped by extensive stakeholder feedback. These will not be procured through the weekly auction trial at this point in time. Changing two variables – the products and markets – would prevent us from drawing clear conclusions on the impact. Instead we will continue to work with the industry this year, and conduct further modelling, as we refine their design.

These changes are driven by our commitment to create accessible and transparent opportunities for all providers, to maximise competition and drive value for end consumers. Stakeholder feedback is vital in ensuring we're making the right decisions and that all voices are represented. Thank you to those who have engaged in the process so far and we encourage you to continue to share your views with us.

Background to reform of frequency response

Decentralisation, decarbonisation and digitalisation

The move to decentralised assets, the growth of low-carbon/ renewable technologies and the integration of digital technologies into everyday life means system operation is becoming increasingly complex and the diversity of our services providers and stakeholders continues to expand.

Reforming frequency response markets facilitates equitable markets for providers and enables us to operate the system more economically and efficiently.

Our rationale for change

Great Britain's transition to a low carbon economy has brought changes to the way we operate the electricity system. We are moving away from a historical reliance on large thermal power generation and there is now a greater diversity of supply and flexible demand than ever before.

This means that not only is system operation becoming more complex, but our provider base is changing and becoming increasingly diverse, and we are continually looking to unlock additional consumer benefits. To meet the future challenges of operating the electricity system and address issues raised by providers, we are in the process of reforming our balancing services and markets to make them more standard, more transparent and more easily accessible for all technologies.

Our publications and how they interact

Our System Needs and Product Strategy (SNaPS) document, published in June 2017, consulted on our plans to reform balancing services and we have since followed up with more detail plans in the product roadmaps for frequency response and reserve, restoration, and reactive power.

Since the publication of the roadmaps, in some instances it has been necessary to adapt our plans in order to fully understand the implications of changes we're introducing and facilitate the additional complexity to some deliverables needed to enable access to services.

Sitting above these documents is the ESO Forward Plan; an annual publication central to National Grid ESO's regulatory and incentives framework. Under Principle 3 (one of seven principles) in the ESO Forward Plan, we are working to ensure that the rules and processes for procuring balancing services maximise competition, reduce barriers and create equitable markets. As we reach the end of product roadmap timeframes, the Forward Plan will be the channel through which we consult on and formalise our commitments on reform of balancing services and market design.

High level deliverables for reform of frequency response

Our deliverables for reform of frequency response can be categorised into: rationalisation; simplification; and improvement.

Rationalisation

In 2017 we announced plans to rationalise, or retire, a number our services that had become obsolete, including Frequency Control by Demand Management (FCDM) and Firm Frequency Response (FFR) Bridging.

Simplification

We have been simplifying remaining services through standardisation of procurement windows and improving the transparency of assessment methods.

Improvement

With the industry, we've been developing improvements such as designing a closer to real-time procurement approach through a weekly auction, creating a suite of new standardised frequency response products, and consulting exclusivity clauses to enable the provision of multiple services.

What we've achieved so far

Completed actions, benefits delivered and feedback received

Focusing specifically on frequency response actions, since the launch of the product roadmap for frequency response and reserve, we have achieved the following deliverable:

Rationalisation

- ✓ Commenced the rationalisation of frequency response products, which has involved the retiring a number of services including Frequency Response by Demand Management (FCDM) and Firm Frequency Response (FFR) Bridging.

Standardised within-day windows for procurement

- ✓ Standardised within-day windows for FFR and now procure the product in 4-hourly Electricity Forward Agreement (EFA) blocks.

This has improved the transparency of our decision-making for our providers and made the tender assessment process more efficient. We saw a significant increase in market participation and this is a first step in moving to an auction.

Contract terms improvements

- ✓ Consulted on changes to FFR contract terms through our Outline Change Proposal (OCP) and Detailed Change Proposal (DCP) process and implemented new contract terms from 31st December 2018 based on feedback received.

Testing and compliance policy

- ✓ Published a consultation on the overarching policy for performance monitoring in September 2018. Subsequently, published a new FFR testing and compliance policy for market participants, to streamline the process and make it more accessible.

Exclusivity and provision of multiple services

- ✓ Consulted on exclusivity clauses for balancing services contracts, in order to enable the provision of multiple services, and presented findings to the Energy Networks Association's (ENA) Open Networks Project.

Feedback was broadly positive, and in response to feedback, we published a matrix of stacking options to show clearly which products can be stacked under current contractual terms. Further collaboration with the DNOs through the Open Networks Project is planned for 2019.

Weekly auction trial

- ✓ Identified a preferred supplier to deliver the trial, completed initial design work based on industry views, signed the contract with our supplier to deliver and operate the platform.

The trial will test closer to real time procurement and facilitate lower barriers to entry, creating increased competition and transparency to deliver lower costs to the end consumer. More details in next section.

Faster-acting frequency response products

- ✓ Held a webinar and a series of technical workshop over Spring/Summer 2018 to seek views on our initial service design.

This has informed our latest work on more detailed service design as we work to create equitable opportunities for all providers. More details in next section.

Our latest developments

Within this chapter…

…we signpost new information not previously circulated with our stakeholders.

This covers our weekly auction trial, to facilitate closer to real-time procurement, and the preliminary design of our new frequency response services.

We encourage you to review and share your comments.

Roll out plans for auction trial

Background

Through our SNaPS consultation in 2017, we received strong stakeholder feedback that we should trial a different procurement method for frequency response. In response, we have committed to trialling a weekly auction to procure a proportion of our frequency response requirements.

The weekly auction trial will create a new opportunity for parties such as wind and solar to access the frequency response market, lowering barriers and thereby increasing competition. Alignment of procurement activities closer to real-time would also allow all parties to assess which revenue streams offer them greatest value, thereby being able to determine where and when to offer their Megawatts.

Given the scale of change involved, this has become one of our most well-known deliverables in reform of balancing services and, as part of the product roadmap for frequency response and reserve, significant work has been completed on in preparation our auction trial.

There is a system benefit from, and a desire from many stakeholders for, even closer to real-time procurement, such as day-ahead. Whilst this is ultimately the direction of travel, we must test and learn from this first fundamental shift in order to inform further changes. Given the weekly nature of the auction trial, there will be one day-head opportunity per week which may better suit providers with particularly variable demand or generation.

Auction characteristics

The trial will last for 24 months from the end of the development phase to ensure that we can test different parameters and approaches prior to full implementation. The auction itself will have the following characteristics:

- The auction will be held every Friday morning with results being published by early afternoon.
- The first available delivery window will start at 23:00 on the same day. This will facilitate access to the market by technology types such as wind and DSR which are less forecastable.
- Phase 2 of the auction will procure four products: faster low frequency static response and high frequency static response, high frequency dynamic response, low frequency dynamic response. The auction will optimise procurement across different products using pre-defined exchange rates calculated in a transparent manner. This will make the trade-off between buying, for example, static and dynamic more transparent.
- The products will be auctioned by four-hourly EFA blocks over the week.
- Providers will have the ability to nominate sequential blocks within day as ‘all-or-nothing’ bids.
- The auction algorithm will seek to minimise the cleared price rather than maximise economic welfare. This means that bids will be accepted in price order without regard to their size.

Roll-out milestones

Development work identified the need for a more sophisticated platform and complex algorithm than initially intended, to deliver maximum benefit.

Following consultation with our technology partner we decided to delay the start of the trial to include additional functionality, and will be launching the auction trial in two phases.

- Phase 1 of our auction trial will launch in Spring 2019. This will be used to test the procurement of one of standardised services – static low frequency response. It will support the transition of providers from FCDM (a retired service) into a competitive market.
- Phase 2 is estimated for delivery in Summer 2019 and will procure all four of the standardised frequency response products.

Auction products

Low frequency static response – Phases 1 & 2

High frequency static response – Phase 2

Low frequency dynamic response – Phase 2

High frequency dynamic response – Phase 2

Interaction with new frequency response products

New products will not be procured through the weekly auction trial as changing two variables – the products and the market – would prevent us from drawing clear conclusions on the impact.

Through Phase 1 of the auction trial we will procure up to 100MW of fast low frequency static response, at a trigger frequency of 49.6Hz. We anticipate that this will increase competition for volume previously procured through bilateral arrangements and increase transparency in the market.

The products bought through the auction trial will be standardised versions of existing products: high frequency dynamic response, low frequency dynamic response, high frequency static response, and low frequency static response. Primary, Secondary and High (PSH) frequency response are not products in themselves and the provision on PSH can be subtly different between units and generation types, so we intend to standardise this with the auction services.

This decision is not driven by system need, but rather to enable us to procure in a more economic and efficient manner. Standardising existing products will allow for more targeted procurement, which in turn means procuring less response and meeting our requirements more economically in a way that removes barriers to a range of provider types.

Preliminary design of new frequency response product suite

In addition to the weekly auction trial, we are redesigning our frequency response products. We published the description of a proposed new suite of frequency response products in May 2018 and have engaged widely, through webinars and technical workshops, to understand how we create new products that work for our diverse range of providers, whilst meeting our system needs in an increasingly economic and efficient manner.

Alongside this, we have undertaken modelling of the new product suite under a number of possible operational conditions, to understand how the products interact with each other and also the existing PSH suite. Initial modelling for the new services is promising and, to build on this, we need further testing to be confident that the services can be used to manage the system across its full envelope of operation.

Proposed new products

1. Dynamic Regulation
2. Dynamic Moderation
3. Dynamic Containment – High and Low
4. Static Containment – High and Low

We have designed these primarily based on system requirements, as stakeholders indicated was their preference through our SNaPS document; the feedback being that this supports technology neutrality and providers could then innovate to deliver the services. This principle for service design has then been underpinned by stakeholders shaping the details of the services they could provide, so we are also able to create products that create no unnecessary barriers.

1) Dynamic Regulation

	Operational Range (Hz deviation)	Lag (s)	Ramp (s)	Duration
Proportional to frequency	+0.015 to +0.1 -0.015 to -0.1	2	8	Continuous

The service is symmetrical meaning that providing 1 MW of the service means providing 1 MW of upward (low) response and 1 MW of downward (high) response.

The design of this product would mean that providers do not need to respond as rapidly as for the other products but must have a duration that allows for continuous operation.

2) Dynamic Moderation

	Operational Range (Hz deviation)	Lag (s)	Ramp (s)	Duration (minutes)
Proportional to frequency	+0.1 to +0.2 -0.1 to -0.2	0.5	0.5	20

The service is symmetrical meaning that providing 1 MW of the service means providing 1 MW of upwards (low) response and 1 MW of downwards (high) response.

The design of this product would mean that providers need to deliver rapid proportional response occasionally to assist with the continuous Dynamic Regulation service.

Deadband

The deadband is the period either side of 50 Hz during which a service is not delivered. The range of the deadband differs between services.

3) Dynamic containment – High and Low

	Operational Range (Hz deviation)	Lag (s)	Ramp (s)	Duration (minutes)
Proportional to frequency	+0.2 to +0.5	0.5	0.5	20
Proportional to frequency	-0.2 to -0.5	0.5	0.5	20

This service is not symmetrical – a provider can choose to provide either or both upwards (low) and downwards (high) response.

The design of this product would mean that providers need to deliver rapid proportional response for infrequent containment events.

4) Static Containment – High and Low

	Operational Range (Hz dev.)	Lag (s)	Ramp (s)	Duration (minutes)
Frequency triggered	+0.3 to +0.5	1	n/a	20 to 30
Frequency triggered	-0.3 to -0.5	1	n/a	20 to 30
This service is not symmetrical – a provider can choose to provide either or both upwards (low) and downwards (high) response. The design of this product would mean that providers need to deliver rapid response for infrequent containment events.				

Participation from intermittent generation

We are also progressing work to increase the participation of intermittent generation in our balancing services.

Power Available is an operational metering signal received from Power Park Modules (wind generators, for example) that combines live weather readings with plant capability to provide a dynamic, real-time indication of maximum potential output. We are working to integrate the Power Available signal provided by Power Park Modules into ESO processes and systems. This will improve control room visibility of intermittent generation and better facilitate their participation in frequency response and reserve services.

This work is underpinned by the creation of the Wind Advisory Group, with support from RenewableUK, to understand more about the challenges around intermittent generation providing balancing services.

Next steps and future engagement opportunities

Auction trial

The next steps for the auction trial involve finalising the necessary internal systems and processes for Phase 1, and further engagement with FCDM providers and other parties seeking to participate in the trial. We'll host webinars and publish material to explain more about the service, contracts and the process for participation, details of which will be communicated shortly. Alongside this, we continue to work with our technology provider to build the platform for Phase 2 of the auction trial.

We are also working with the Association for Decentralised Energy (ADE) and its members to establish an improved pre-qualification process for parties who are not subject to live witness testing for the Balancing Mechanism (BM) . This will involve providers verifying their testing data with an independent technical expert, as opposed to verification being carried out solely by National Grid ESO. This is intended to reduce the time required for pre-qualification and we are looking to introduce this approach for the auction trial.

New frequency response products

We will build on modelling undertaken so far and conduct further modelling to test how the new products work on a real system across its full range of operation to ensure we are aware of all consequences. We're also planning the necessary system and process changes to allow a fundamental change to how we manage frequency in the ESO Control Room.

We welcome an initial feedback on the details shared within this document and, as this work progresses, we will engage through a number of forums, including webinars and external events in order to explain the products in more detail and seek views from our stakeholders.

Please contact us via: futureofbalancingservices@nationalgrid.com

How to stay up to date

There are a number of ways you can keep up to date on the progress we're making on the reform of frequency response and other balancing services. We signpost the latest developments through:

- ✓ The **Future of Balancing Services website** – this includes our monthly newsletter published on the site.
- ✓ The **Future of Balancing Services mailing list**, which is sent to subscribers – you can subscribe via the Future of Balancing Services website.
- ✓ The **Power Responsive mailing list**, which is sent to subscribers – you can subscribe via the Power Responsive website.
- ✓ **ESO incentive performance and reporting** – National Grid ESO's priorities and commitments for the year, including the reform of balancing services, are set out in our ESO Forward Plan. We report on progress on a monthly, quarterly and six-monthly basis on the ESO incentives performance and reporting website.
- ✓ The **Six Month Operability Report** is one of our ESO Forward Plan commitments and highlights the challenges we face in maintaining an operable electricity system, and the work we are undertaking to ensure we meet those challenges. This includes the actions set out in the product roadmaps.

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