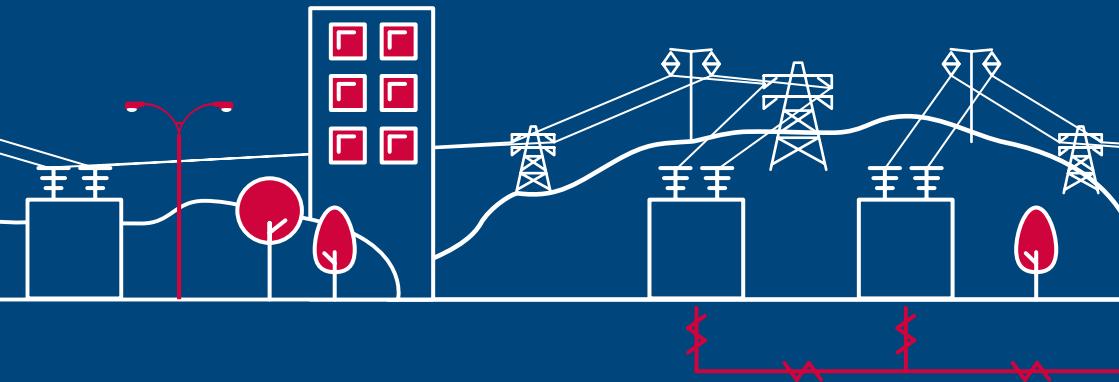


# Product Roadmap

For Frequency Response and Reserve



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## Foreword

We have listened to your views and are now delivering on your asks...

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**Over the past 12 months the National Grid System Operator (SO), driven by extensive industry engagement, has led an exciting and innovative programme of change to the products and services we use every day to balance the electricity network.**

Following an initial industry survey in October 2016, it was clear that change was needed – with the number of balancing service products and associated information provided needing improvement. This feedback led us to publish, in June 2017, our ‘System Needs and Product Strategy’ (SNAPS) consultation which outlined the SO’s system balancing needs (Response, Reserve, Reactive Power, Black Start and Inertia) and set out how these products could likely develop over time.

In SNAPS, we asked for your ideas to simplify and evolve the balancing services products we use, describing three stages of changes to our products: rationalisation, simplification (standardisation) and improvement. The intention was to identify the potential barriers to fully functioning markets, and help prioritise our development work.

**We listen...** We received 128 responses, with the vast majority agreeing with our proposed approach. You asked us to increase the standardisation of our products, move procurement closer to real time – but with periodic longer term contracting opportunities – and ensure there was a greater emphasis on trialling new ways of working.

You also agreed that we should lower the barriers to entry in our markets, and although there were differing views as to the best way of achieving this there was agreement that transparency of information was fundamental to any improvements. The quality and volume of responses to this consultation was fantastic, and we are extremely grateful to everyone who contributed to the continued engagement in this process.

**We are today publishing a roadmap of actions for our frequency response and reserve markets.** This document outlines the principles which govern how our balancing services products will develop over time, providing greater clarity and investor certainty. We also provide a view of actions we are undertaking in those service areas to simplify and improve the products.

We will deliver a new document, via our [Future of Balancing Services web page](#), on other service areas such as Reactive Power, Black Start and Constraint Management in Q1 2018.

We would like to thank everyone that continues to provide support and feedback; we really do value it. I look forward to working with you all in the coming year, as we implement the changes.

**Cathy McClay**  
Head of Commercial, Electricity

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# Executive summary

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## **The System Operator is looking at how it can best develop a more flexible electricity system which makes the most economic and efficient use of all available resources to meet the continuing needs of the electricity network.**

To do this, we intend to create balancing services products that allow all providers, new and existing, to participate in markets. This document sets out the actions we are taking, specifically in the frequency response and reserve service areas. The proposed milestones are shown in Figure 0.1 on the following page.

The highlights from the roadmap include:

- standardising existing products (Firm Frequency Response, Short Term Operating Reserve (STOR), Fast Reserve) to deliver greater transparency in the existing products
- introducing a set of faster-acting response products to meet the SO's needs
- delivering a trial of closer to real-time procurement using a pay as clear mechanism to test how we can better optimise the procurement of our SO needs in the future and optimise the use of all assets on the system; and
- reviewing our contracts and clauses to lower barriers to entry.

This will be followed in the first quarter of 2018 with another document outlining the SO's proposed actions in the remaining service areas (reactive power, black start, and constraints).

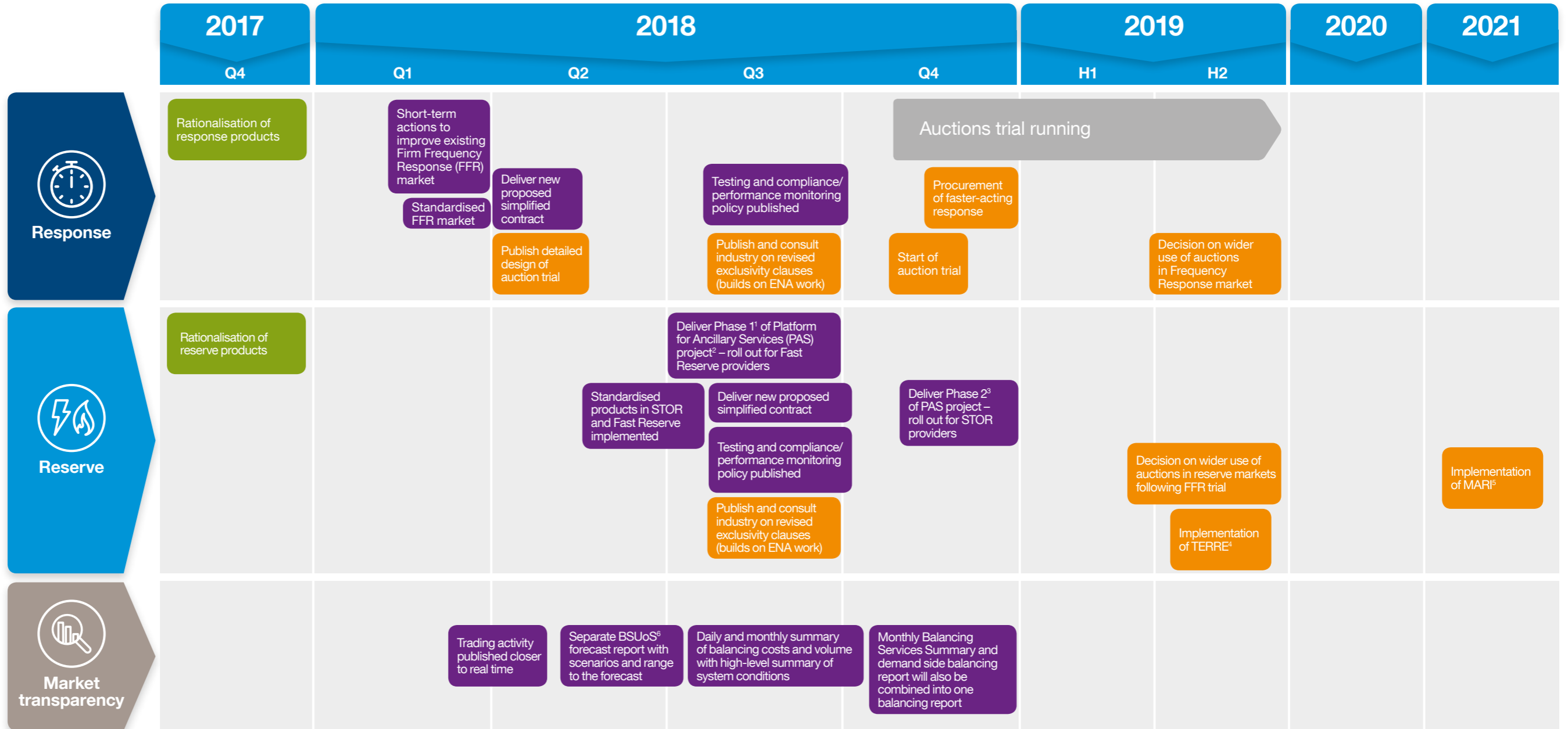
This roadmap is underpinned by a vision of an SO that procures ever more effectively, adapts to its environment and engages with market participants in an agile way. We are also working with our colleagues in the distribution networks, incorporating the work undertaken within the Energy Networks Association (ENA) in our products and redefining our ways of working.

# Executive summary

Figure 0.1  
Roadmap of actions

Key

- Rationalisation
- Simplification
- Improvement



<sup>1</sup>This is an agile project which will retain flexibility on which features to deliver and in which order depending on service priorities and technical considerations.

<sup>2</sup>New despatch and monitoring solution to support the end-to-end lifecycle of existing and future reserve services.

<sup>3</sup>This is an agile project which will retain flexibility on which features to deliver and in which order depending on service priorities and technical considerations.

<sup>4</sup>Trans European Replacement Reserves Exchange.

<sup>5</sup>Manually Activated Reserves Initiatives.

<sup>6</sup>Balancing Services Use of System.

# Chapter one

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Principles

06

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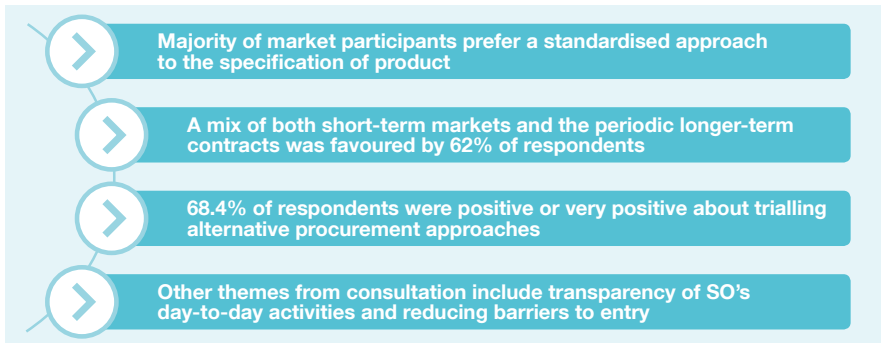
# Principles

## You asked the SO to operate differently

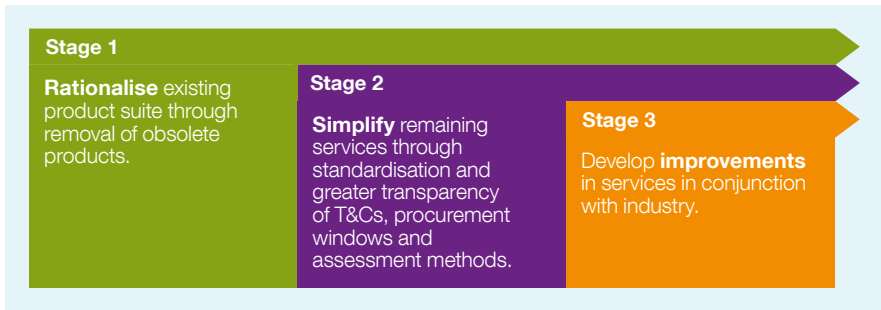
A few years ago the System Operator (SO) dealt with approximately 20 providers of balancing services to the SO. Today, that number has grown dramatically to over 350 market participants. We now handle 250+ queries every year from new parties looking to provide services to the SO. This growth in participation has come at the same time as a change in the makeup of the providers, from large transmission-connected thermal plant to small distribution-connected renewables and load aggregation. This change has thrown the design of our products and markets into sharp focus, highlighting that we need to find new ways to facilitate participation in markets to continue to balance the system economically and efficiently.

The SNAPS document set out the future system needs and consulted on the future of balancing services products. A detailed overview of the responses from market participants can be downloaded here: [Future of Balancing Services web page](#). Figure 1.1 provides a view of the key highlights which underpin our conclusions and proposed actions.

*Figure 1.1*  
High level summary of SNAPS responses



**Figure 1.2**  
*Three-stage process in evolution of SO's products*



### What are we delivering as part of this product roadmap?

In the SNAPS consultation, a three-stage process was set out to improve and develop our products and markets (Figure 1.2).

The 'rationalisation' process has now concluded and focuses on delivering simplification and further improvement to markets (as per stages 2 and 3 in Figure 1.2 above).

### Principles which will govern how SO procures in the future

This product roadmap aims to reduce uncertainty by:

- providing a set of principles which will govern the way the SO will procure in the future
- backing those principles with actions in relevant service areas.

We have developed three principles that will govern the way we procure services in the future. These principles were widely discussed with market participants in October and November through engagement events and generated broad consensus.

### SO–DSO interactions

Many parties discussed the interactions between the SO and the DSO as being a critical factor to the future evolution of balancing services. As the distribution networks become smarter, greater coordination is required to allow parties to provide multiple services to multiple market participants (e.g. SO, DSO, Suppliers etc.). The SO is committed to enabling the delivery and creation and emergence of DSO models to drive consumer value in optimising the use of transmission and distribution assets on a coordinated, whole-system basis.

The ENA Open Networks Project is a key initiative which will deliver the commercial and technical processes which will allow the optimisation of assets on a whole system basis. The SO is working collaboratively with all DNOs as part of the Open Networks Project to realise this ambition.



# Principles

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## Principle 1

**Our procurement decisions will be transparent and our methodology and needs will be clear to the market ahead of time.**

In practice, this principle means:

- providing information on our needs and methodology ahead of a procurement event
- parties understanding why they were successful or not in procurement submissions
- that we avoid bundled procurement of products where possible, e.g. not procuring frequency response, headroom and reactive capability at a single price
- where there is an economic or operationally justifiable reason for bundled procurement, we will be clear on the value interaction between the requirements
- where parties do not fit into a standard product (e.g. they deliver in 11 seconds instead of 10 for primary), we will clawback the variability through pre-agreed contract terms
- we will publish trading activity at near real time (Q1 2018) and create a new separate BSUoS report with scenarios and sensitivities around forecasts and commentary on historic accuracy (Q2 2018)
- we will make all underlying data for tendered balancing services and the Monthly Balancing Services Summary available in one place in a usable format (Q4 2018)
- we will also be creating YouTube videos explaining aspects of the operation and procurement of the products.

## Principle 2

**The design of our products, the way we procure, and the contractual arrangements will increase competition in provision of services to the SO.**

In practice, this principle means:

- where possible, products will facilitate stacking of revenues through a review of contracts and exclusivity clauses (this will be a collaborative deliverable with the Energy Networks Association)
- products will allow for variable baselines or closer to real-time capability updates to account for different types of assets e.g. wind and solar
- providers continue to ensure compliance with upfront pre-qualification using a detailed process provided by the SO; the SO increases focus on ongoing performance monitoring through a rigorous and published process, which is backed up by significant contractual penalties; and
- a mix of short-term markets and periodic long-term contracting opportunities will be made available to parties following the overwhelming feedback received from providers.

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## Principle 3

**Our products will be designed to balance both operational requirements and the technical ability of provider assets while maintaining system security.**

In practice, this principle means:

- the SO will continue to be technology neutral, ensuring that the design of products is based on the operational requirement and aiming to capture as many technical capabilities as possible within those products; and

- the design of our products will aim to minimise barriers to market entry for existing technologies, but also for new and emerging technologies as far as practicable.

We will also aim to future proof our balancing services products through considering European guidelines when designing our products.

# Chapter two

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Frequency response

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# Frequency response

## Part of our role is to maintain a stable system frequency. Frequency response is an automatic change in generation or demand to counteract changes in system frequency.

System frequency changes when there is a mismatch in the energy added to the system by generators and the energy taken off the system by demand consumers. This mismatch acts to either speed up or slow down the frequency of the grid, and frequency response is the balancing service used to counteract this change.

'Dynamic' response is used to continuously follow and control minor deviations in frequency due to small imbalances in generation and demand. 'Static' response activates when a fixed frequency limit is breached. It is used, in conjunction with dynamic response, to contain large frequency events such as generator or demand trips.

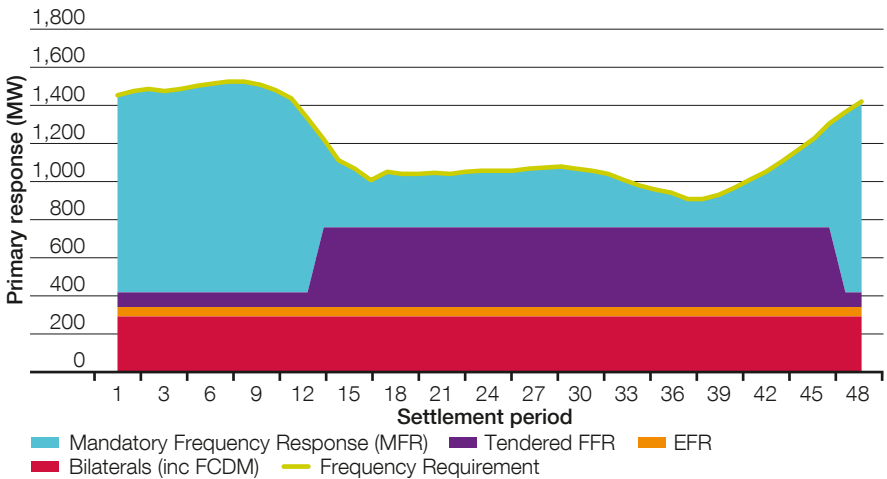
At present we procure frequency response through a number of routes:

1. The **Mandatory market** for those parties who have a Mandatory Service Agreement (MSA), typically large transmission-connected generators. This market is accessed within day by the SO to manage short-term variability in requirement driven by changes in the generation mix. The products available are Primary, Secondary and High dynamic response. The market arrangements are set out in the Charging and Use of System Code (CUSC). Providers are able to submit availability ('holding') prices on a monthly basis; utilisation payments (Response Energy Payment) are based on a methodology in the CUSC which aims to net a provider's energy position using a basket of market indices.
2. The **Firm Frequency Response market (FFR)** for parties with a Framework Agreement; these could be any asset or combination of assets that can provide the relevant product. This market is accessed monthly by the SO to lock in a committed level of frequency response on a longer term basis (1–24 months). The products available are Primary, Secondary and High dynamic response, and Secondary static response. The market arrangements are set out in the Standard Contract Terms and the Market Information Report.
3. **Specific contracts**, such as Frequency Control by Demand Management and Enhanced Frequency Response (EFR). These contracts are used where there are technical or operational reasons why parties cannot participate in the existing markets. The majority of these are legacy arrangements, and we are no longer actively pursuing them as we are committed to moving towards transparent and competitive market solutions.

The amount of frequency response we procure through each route varies considerably depending on the conditions on the day and what has been economically procured in the FFR market. Figure 2.1 shows how our frequency response requirements are met by a mix of mandatory market, FFR and bilateral contracts. The spend associated with each market can be found in our Monthly Balancing Services Summary reports, or the annual C16 Procurement Report<sup>1</sup>.

<sup>1</sup><https://www.nationalgrid.com/uk/electricity/market-and-operational-data/transmission-licence-c16-statements-and-consultations>

**Figure 2.1**  
Illustration of typical frequency response requirement components



We are forecasting that while the baseline frequency response requirement will remain broadly the same over time, there will be an increase in the variability of our requirement closer to real time. This variability will also increase in size as system inertia decreases and demand behaviour becomes increasingly reactive to market signals.

We have already made a number of improvements in our frequency response products over the past two years:

- the introduction of a Firm Frequency Response Bridging contract<sup>2</sup> to remove barriers to entry for smaller parties

- a reduction of the minimum participation size in FFR from 10MW to 1MW
- allowing parties to stack two different FFR contracts so virtual power plants can grow
- an increase in transparency with the information provided through our Market Information Report; and
- reviewing and clarifying our testing guidance for Distributed Energy Resources (DER) providers.

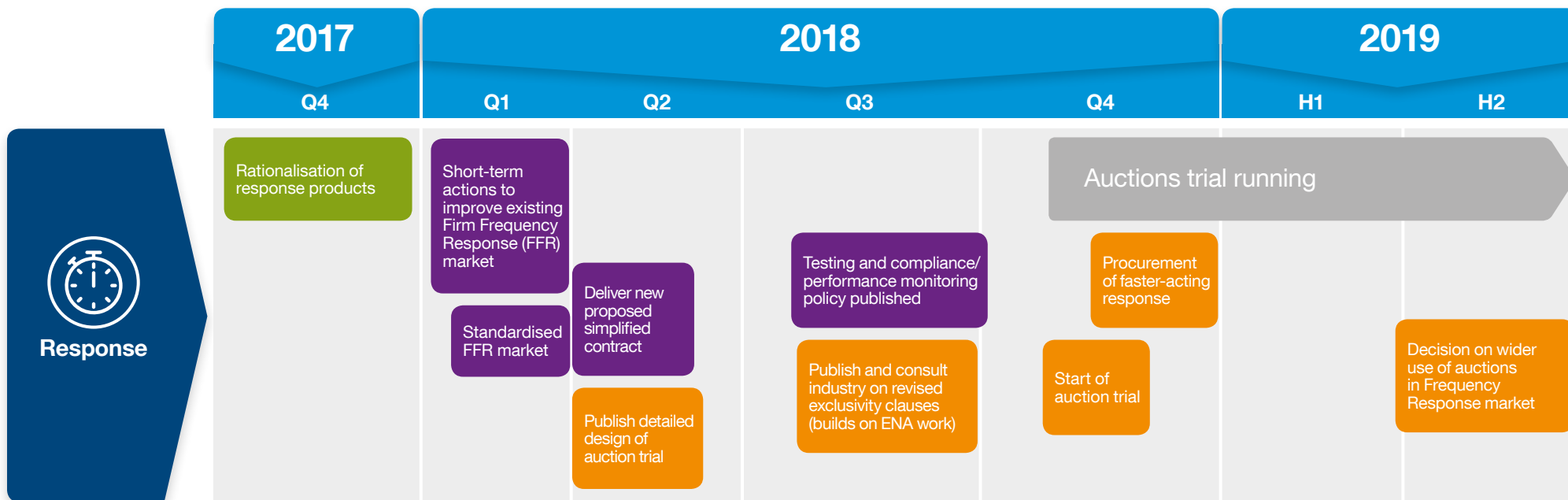
We are continuing to develop our commercial frequency response market, while working to identify and scope more fundamental changes.

<sup>2</sup>While this product has now been removed from active procurement through our rationalisation process, it was a useful transitional arrangement allowing parties to increase their portfolio size and stimulated the market for static response.

# Frequency response

Figure 2.2 provides a view of our work across all three stages: rationalisation, simplification and improvement.

*Figure 2.2*  
Frequency response market product roadmap



## Stage 1: Rationalisation

The review of our existing product suite concluded with a letter published to the industry on October 30 2017<sup>3</sup>, in which we set out our intention to remove the following frequency response products from active procurement:

- Firm Frequency Response (FFR) Bridging
- Frequency Control by Demand Management
- Enhanced Frequency Response.

In practice this means that we will not be actively procuring those products in the future, however it does not mean we will

be cancelling existing contracts or that the underlying requirement has changed, rather, we are intending to meet the requirement in a more transparent and competitive way. We are working with all affected parties to transition them to new routes to market.

Once we have rationalised the above products, the remaining frequency response routes to market are those procured through the monthly FFR tender and the mandatory within-day market.

## Stage 2: Simplification

The aim of this phase of the work is to simplify the remaining products and break down barriers to entry where possible.

The majority of the feedback from the consultation highlighted issues with the complexity of both our balancing service products and the assessment of how we procure services. This complexity is acting

as a barrier to new entrants and technologies, but also making it difficult for existing parties to identify the optimum tendering strategy and hence deliver best value to the end consumer. We are therefore taking a number of actions in our commercial frequency response market (Firm Frequency Response) to address these concerns.

## FFR short term actions

In the Operational Forum on October 19 we committed to undertake a number of actions to make the current FFR market more transparent and easier to access. We recently published a letter setting out a number of 'quick wins' that we are implementing in the FFR market<sup>4</sup> in the immediate future.

These actions range from providing more information in the post-tender report, providing more guidance on the assessment process itself, to changing the timeframes of the tender itself. All the changes will be delivered by end of Q1 2018.

<sup>3</sup> <https://www.nationalgrid.com/uk/electricity/balancing-services/future-balancing-services>.

<sup>4</sup> 'FFR Simplification Update' <https://www.nationalgrid.com/uk/electricity/balancing-services/frequency-response-services/firm-frequency-response>.

# Frequency response

## FFR Standardised windows and contract length

We have also identified two areas of the current FFR tender design which could be standardised. These are:

- term of contracts and
- the daily windows.

Reducing the allowable variability in these areas will increase transparency of our volume requirement, thereby allowing parties to have a better understanding of the value of individual tenders to the SO, which in turn would aid competition. This milestone will be delivered in Q1 2018.

*Figure 2.3*  
*Illustrative FFR contract duration*



...and the cycle continues.



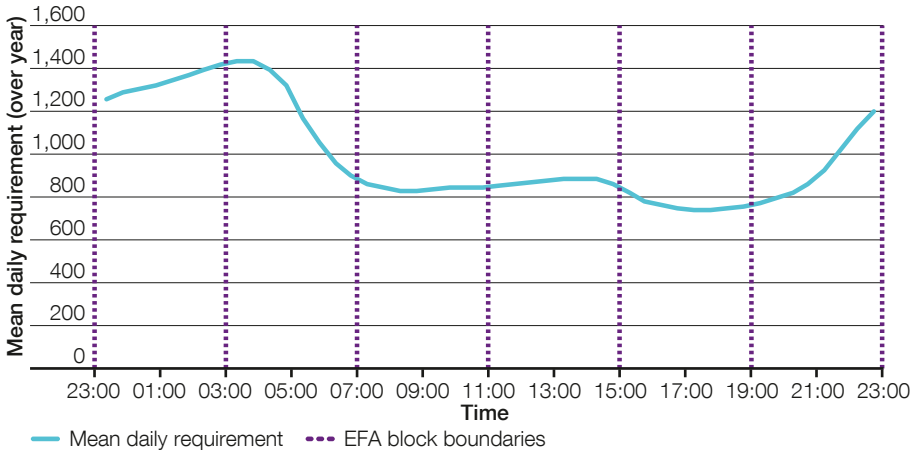
**Duration of contract:** Currently providers can tender in for any number of months, from 1 month out to 24 months. This makes comparing competing tenders that cover different time periods very challenging, both for the market and the SO. We will therefore be changing our procurement to tender for standard periods as is the case for the wholesale market. It is anticipated that these standard products will be front month, front quarter and seasons going out 30 months (see Figure 2.3). Parties will be able submit linked bids for a number of standard products. The approach is intended to provide greater transparency of pricing whilst allowing parties investing in new assets to access longer term contracts and build a development period into their tendering strategy.

For new assets, it will still be possible to tender in for FFR services if the equipment is not in place and/or assets are not yet operational. Tender rounds will be structured to allow parties to tender for our short-term requirements on a monthly basis. Our current thinking is that it is efficient to tender for longer-term requirements on a quarterly basis.

**Daily windows:** At present providers can decide which hours of the day they are available for, further split by Working Days, Saturdays, and Sundays/Bank Holidays. This allowable variability creates over a million different possible combinations of tendered windows. We have reviewed our daily requirement profiles with a view to reducing this variability to a manageable level, and are introducing daily windows to align with EFA blocks (Electricity Forward Agreement), the timings for which are every four hours starting from 23:00 (Figure 2.4). This also aligns with the wholesale energy market, where standardised timeframes for delivery of energy are the norm. We are retaining the ability for parties to provide different availabilities on weekdays, Saturday, and Sundays/bank holidays as these have an effect both on the operational need for response as well as providers' operational schedules and availability. These windows will be consulted on to ensure that they meet providers' needs as far as practicable.

# Frequency response

Figure 2.4  
EFA blocks



Through the Market Information Report we will be providing specific volume requirements for each window, as well as forecasts of future need. These will be combined with an indication of the volume we are intending to procure in the long term and how much we will be looking to hold back for the month-ahead tenders.

The impact of the above changes will be to reduce the number of possible tendered combinations from several tens of millions to a few hundred with a consequential increase in market transparency and clarity of market price.

---

## Contract Review and delivery of new simplified contract

Feedback from smaller providers who may not have access to dedicated legal support has been that the contractual terms that apply to our tendered markets are very complex and in some cases do not accurately reflect their understanding of the service requirements. This is a particular concern for the FFR market, where the contract terms include four separate sections depending on whether the provider, a BM or non-BM party, is providing dynamic or static frequency response.

We are therefore reviewing and simplifying the existing FFR Standard Contract Terms (SCTs) to aid clarity and remove ambiguity. The aim of this is to simplify the language and the length of contract, clarifying rights and obligations of all parties. We will also be using this opportunity to consider the feedback on specific clauses that we have received from parties through bilateral discussions. We will engage with industry on the new proposed contract in Q1 2018 through the consultation process defined in the SCTs.

---

## Review exclusivity clauses

We have exclusivity clauses in our contracts to ensure the availability of resources to meet our requirements and secure the system. This exclusivity is reflected in our assessment of the price we are willing to pay for these products. However, we understand that in the future, parties may want to increasingly offer multiple services in the same time window to multiple entities (e.g. SO, Distribution System Operator, Suppliers etc.).

As part of the contract changes, we will be reviewing the exclusivity clauses which currently prevent parties from providing other commercial services to third parties. This work

will be undertaken with the Energy Networks Association under the Open Networks Project<sup>5</sup>, facilitating the emergence of the DSO model. This review of exclusivity clauses is particularly important as DSOs manage increasingly constrained networks which may in turn prevent parties in the future from being able to participate in as many markets as they might.

The review will build on analysis already carried out by the SO and the DSOs on how conflicts may arise in the provision of services. We will engage with industry on recommended changes at the end of Q3 2018.

---

<sup>5</sup> The ENA project is examining how the roles of the SO and the DSO will change in a world where there is greater interaction between parties at the transmission and distribution interface.

# Frequency response

## Testing and compliance/performance monitoring policy published

One of the main barriers to entry into the FFR market that parties highlighted is the lack of clarity around upfront testing and the length of time it takes for the SO to review testing data prior to a site being able to tender into the market. For a new entrant, this can mean an unacceptable delay in getting paid for the provision of services. This is therefore a key focus for us in terms of reducing barriers to market entry.

We will be reviewing our current testing and compliance policy for both BM and non-BM parties providing frequency response services to the SO. This testing and compliance policy will be designed to

build on a greater focus on performance monitoring. We will be working with industry to determine the granularity and frequency of data which will be needed for ongoing performance monitoring, thereby allowing parties to select their metering solutions.

The ongoing performance monitoring initiative will allow the SO to pull data from parties as and when needed and monitor the performance of parties against their contractual obligations. A structure for penalties will be proposed as part of this process. In Q3 2018, we will be publishing both the new testing and compliance policy and the performance monitoring one.

## Simplification summary

At the end of the simplification phase (Q3 2018), we will have a standardised FFR market providing greater clarity and transparency to all parties. The FFR market will be easier to navigate for providers and reduce the difficulty of assessing the tenders for the SO. Providers will have more information on which to base their decisions (e.g. publication of assessment principles). We will also have simplified contracts and

clear clauses relating to the rights of parties in relation to the provision of multiple services to multiple market participants. Finally, the ongoing work in relation to testing and compliance will have been extended to both BM and non-BM providers, providing a clear pathway for how testing and compliance as well as performance monitoring will be carried out for all parties involved in FFR.

## Stage 3: Improvement

While it is important to address the challenges facing the existing products and markets, there are areas where we need to go further to address both fundamental barriers to market entry by non-traditional participants and also new operability challenges as the generation mix changes.

The improvement work being undertaken in the Frequency Response market represents new opportunities for existing assets or new types of assets which have struggled to access the FFR market.

## Auction trial and closer to real-time procurement

The existing monthly procurement in FFR works well for providers who can forecast and control their availability over weeks and months. For providers who could provide frequency response but who cannot forecast or control their availability (e.g. wind, solar, DER), the timescales of the FFR market represent a potential barrier to participation.

We are intending to carry out a trial of closer to real-time procurement using a pay as clear mechanism. Moving procurement closer to real time 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.

Feedback through the consultation showed a strong preference for moving to day-ahead procurement of frequency response, to maximise the ability of providers to forecast their availability and maximise the number of opportunities to participate in the market. The SO wants to move its procurement timescales as close to real time as possible. However we must balance this desire against the importance of frequency response to the security of the system, the risks involved in implementing such a large change and the need to have time to analyse the results of each auction round and learn from the trial. Our trial will therefore procure frequency response at week ahead, with the intention of reviewing the potential to move to day ahead once we have a greater understanding of the implications.

In moving procurement closer to real time, we must also consider whether to continue with a pay-as-bid tender or trial a cleared-price auction approach. Pay-as-bid tenders are useful for immature and uncompetitive markets in that they allow for price and volume discovery, but they also result in different prices being paid for the same product. They do not necessarily address the issues created by a monopsony market (i.e. a market with multiple sellers but a single buyer), which effectively allows the buyer to influence the market price.

We are therefore proposing to also test a pay as clear mechanism approach to procurement as part of the trial. The benefits are that price discovery is down to the market participants.

The auction trial will enable us to test assumptions and behaviours in a safe environment, and identify implementation and scalability issues prior to deciding on the possibility of a wider rollout. We are currently working with a number of auction platform providers to scope a trial for 2018 to be funded by the Network Innovation Allowance Scheme. The trial will include a full cost-benefit assessment of the hypotheses as well as understanding impacts on other markets (e.g. mandatory frequency response). This will contribute to the decision on whether wider implementation of the pay as clear auction and of closer to real-time procurement will be of benefit to the end consumer. This decision will be taken in Q4 2019 after the trial is complete.

# Frequency response

**Table 2.1**  
*Frequency auction trial – overview*

What time are we auctioning?	In line with the timescales of the day-ahead energy market (e.g. 10.00 am at the latest on a given day) – subject to mapping with our control room processes internally
Products	Different auctions for each product: dynamic primary/secondary; dynamic high. Potential for fast dynamic and fast static
Price cap	In place for the first two months as the auction trial runs in shadow mode to ensure it works well
Pre-qualification	Sign up to framework agreement on internet
Availability windows	Our proposal is for distinct EFA blocks consistent with our standardisation approach for FFR
Settlement	Potential for automatic settlement through platform
How much are we auctioning?	This will be determined as part of the detailed design
Rollout of standardised timeframes	Q1 2018

The proposed trial will consist of a week-ahead pay as clear auction for a low frequency dynamic product (combined equal amounts of Primary and Secondary) and a high frequency dynamic product (High). We will also be looking at whether we can include faster-acting products (see next section).

Once the tender for development of the platform has been awarded, we will work with industry to further design the platform and invite expressions of interest in participation in the initial shadow period. The details of this will be discussed with industry during the design phase.

It is anticipated that there will be a two-month period where only shadow bids are accepted on the trial platform, in order to test the process and address any issues that arise during rollout, followed by a 10-month period where the auction will operate in parallel with the existing FFR tender.

The total volume to be auctioned and bid size is yet to be determined, however it is anticipated that this trial will reduce both the volume procured through the within-day mandatory market and the volume procured through the FFR tender due to the timescales involved. This does not mean that the importance of the mandatory market or the month-ahead tender is diminished, as they will both continue to provide an essential function to the SO in managing system frequency.

## Faster-acting response

As the generation mix continues to change from large synchronous plant to smaller, decentralised renewables, the amount of inertia on the system is continuing to decrease. This results in system frequency becoming more volatile closer to real time.

The existing Enhanced Frequency Response (EFR) product will improve operation of the system, but in its current form is not necessarily the optimum design of a fast acting product. Further analysis has been undertaken since the EFR process concluded into what a sustainable fast acting product could look like, for both static and dynamic, and we intend to use that learning to include faster-acting response in our frequency response market.

Our existing frequency response products are required for two main reasons: firstly to control frequency under normal operational conditions, and secondly to contain frequency excursions caused by sudden plant loss (Figure 2.5). While the EFR product was designed to meet both needs, in future

a more efficient use of fast-acting assets could be in addressing the problem of frequency containment alone.

In designing a new frequency containment product, we must ensure that it delivers against the operational requirement, while acting in harmony with the existing Primary, Secondary and High response products. We have identified two types of containment product, static and dynamic, both with the characteristics of fast delivery of active power and short duration of delivery. An illustration of the concept is provided in Figure 2.5.

In this example, the containment products, both static and dynamic, would trigger in one-second timescales but at different frequency trigger points, and would have different durations. At present we are considering a duration of 60 seconds for dynamic containment and up to 30 minutes for static containment, however these values are subject to further review, consultation and modelling.

<sup>6</sup> Network Innovation Allowance funding will be used to do the auction trial.

# Frequency response

**Figure 2.5**  
How faster-acting response products fit in with existing Primary, Secondary and High

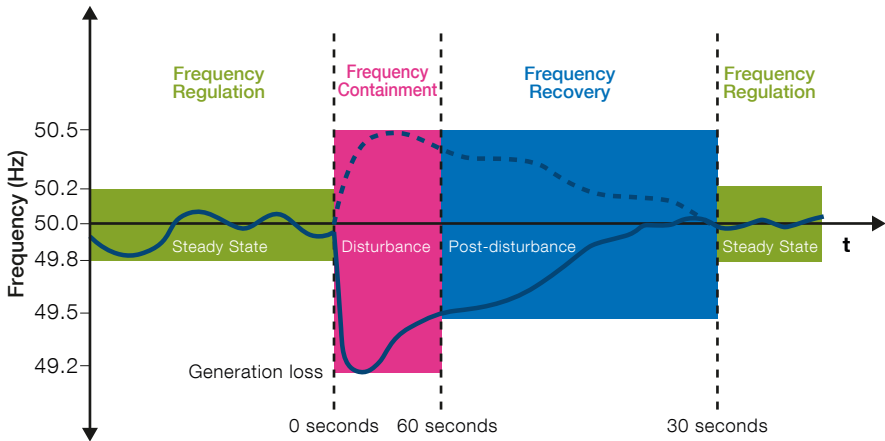


Figure 2.5 illustrates how containment products can be incorporated to deliver a coherent frequency response service, showing how response output is delivered as frequency changes.

We are investigating how to introduce the fast-acting frequency containment products around existing commercial frequency response products. We are considering both static and dynamic response services for both high and low frequency containment, with separate volume requirements and value

assessments. We plan on procuring faster-acting response towards the back end of 2018, subject to further analysis and modelling.

However, it should be noted that as we procure different types of frequency response, particularly faster-acting products, the volume of the existing products that we are buying will likely reduce. We are working to understand the interaction between volumes of fast and slower-acting frequency response products, and how to build these interactions into a sustainable market.



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## What could the end state for frequency response look like?

The steps outlined in this Product Roadmap are being taken both because we believe they deliver improved value to the SO and consumers, but also because we believe they allow us to test concepts and improvements that can be built into the frequency response market end state.

As highlighted above, the SO's system needs will be more volatile closer to real time. In order to meet those operational needs, our ambition is to have a closer to real-time frequency response market that combines

the existing dynamic products of Primary, Secondary and High with new fast-acting frequency products. We also want to provide a longer-term contracting opportunity for the same products, and ensure that those products are standardised and stackable. We will continue to investigate alternative approaches to addressing the issues with our balancing products and markets, and will work with industry to develop, test and refine the elements of this ambition over the next twelve months.

# Chapter three

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Reserve

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# Reserve

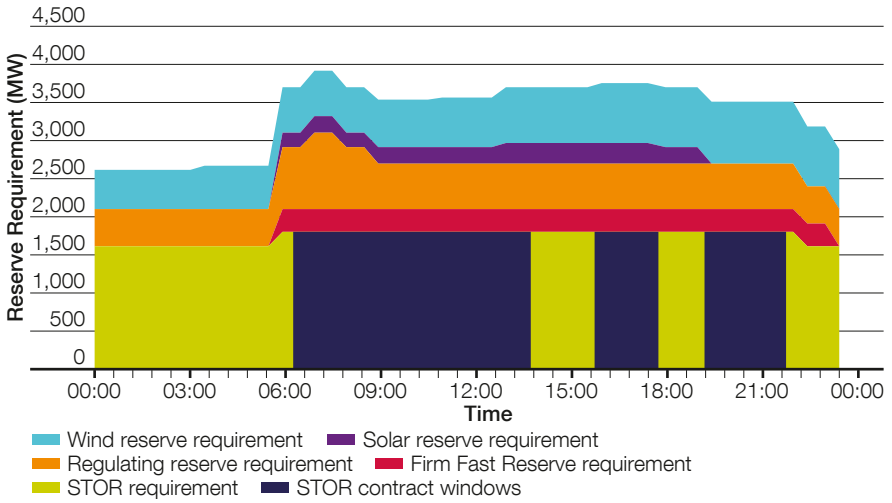
**Reserve is needed to ensure that imbalances arising from forecasting errors or unexpected losses on the system can be managed.**

Reserve is manually instructed after automatic frequency response services have delivered. Reserve can be either upward (an increase in generation/decrease in demand) or downward (a decrease in generation/increase in demand). Reserve is also used to describe the actions that we take to ensure that sufficient upward and downward flexibility is available. We use a mix of balancing services products, the Balancing Mechanism (BM) and trading to ensure that we have access to reserve in the necessary timescales.

At present we procure reserve energy through a number of routes:

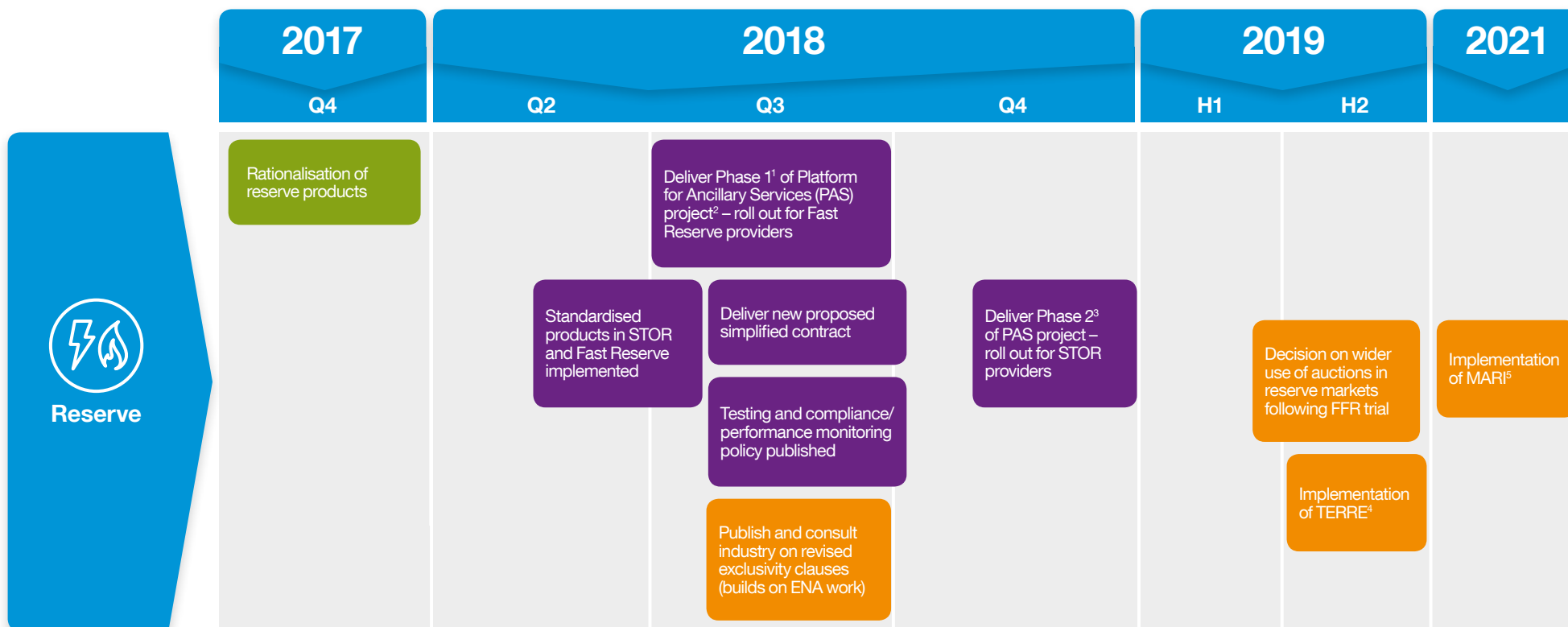
1. The **Short Term Operating Reserve (STOR)** market for parties with a Framework Agreement, typically a mix of distribution- and transmission-connected generators. This market is accessed three times a year by the SO as the seasonal requirement changes to lock in a committed level of positive reserve over a period of several months ('seasons'). It is instructed by the SO to manage short-term supply losses, localised constraints or any other variability driven by changes in the generation and demand mix. It typically delivers from instruction in five minutes or beyond, depending on the provider. The products available are Committed, Flexible, Premium Flexible which have different levels of required firmness of availability. The market arrangements are set out in the Standard Contract Terms and the Market Information Report.
2. The **Fast Reserve (FR)** market for parties with a Framework Agreement. This market is accessed monthly by the SO to lock in a committed level of positive reserve long term (1–23 months), and there is a single product available. It is instructed by the SO to manage short-term supply losses. It typically delivers in timescales of less than two minutes from instruction, depending on the provider. The market arrangements are set out in the Standard Contract Terms and the Market Information Report.
3. The **Demand Turn-Up (DTU)** market for parties who have a Framework Agreement, typically aggregation of true demand and behind the meter generation. There are two products, Fixed and Flexible. This market is used by the SO to access negative reserve either for the following summer (through the Fixed product) or for the following half-week (through the Flexible product). It typically delivers in timescales of a few hours from instruction, depending on the provider. The market arrangements are set out in the Standard Contract Terms and the Market Information Report.
4. Specific contracts, such as **Optional Reserve**. These contracts are used where there are technical or operational reasons why parties cannot participate in the existing markets, or where there is currently no route to market for a specific additional service.

**Figure 3.1**  
*Illustration of typical Operating Reserve Requirement components*



# Reserve

Figure 3.2  
Reserve market product roadmap



<sup>1</sup> This is an agile project which will retain flexibility on which features to deliver and in which order depending on service priorities and technical considerations.

<sup>2</sup> New despatch and monitoring solution to support the end-to-end lifecycle of existing and future reserve services.

<sup>3</sup> This is an agile project which will retain flexibility on which features to deliver and in which order depending on service priorities and technical considerations.

<sup>4</sup> Trans European Replacement Reserves Exchange.

<sup>5</sup> Manually Activated Reserves Initiatives.



# Reserve

Figure 3.2 provides a view of what we are doing at all three stages: rationalisation, simplification (standardisation) and improvement.

The amount of reserve we procure through the markets varies considerably depending on the conditions on the day and what has been economically tendered in. The volumes and spend associated with each market can be found in our Monthly Balancing

Services Summary reports, or the annual C16 Procurement Report. We are forecasting that while the baseline reserve requirement will remain broadly similar, there will be an increase in the variability of our requirement closer to real time. The predicted reduction in system inertia is not anticipated to affect reserve requirements as they are mainly driven by the size of the largest loss rather than the speed at which that loss is felt.

## Stage 1: Rationalisation

The review of our existing product suite concluded with a letter published to the industry on October 30 2017<sup>6</sup>, in which we set out our intention to remove the following reserve products from active procurement:

- STOR Runway, and
- Enhanced Optional STOR.

In practice this means that we will not be actively procuring those products in the future, however it does not mean we will be cancelling existing contracts or that the underlying

requirement has changed, rather, we will be procuring those through alternative market-based routes. Both products were introduced to facilitate access to the market by non-BM or demand aggregation providers, and we will be ensuring that the issues they were created to address are being rolled into the existing STOR market and the future reserve market.

We will continue to meet our reserve requirement through the existing Fast Reserve and STOR products.

## Stage 2: Simplification

The majority of the feedback from the consultation highlighted issues with the complexity of both our balancing service products and the assessment of the markets in which they were bought. This complexity is acting as a barrier to new entrants and technologies, but also making it difficult for existing parties to identify the optimum

tendering strategy and hence deliver best value to the SO and for their business. We are therefore taking a number of actions in our reserve markets to address these concerns, as well as progressing the standardisation of the products and improving information on the transparency of our instructions.

<sup>6</sup><https://www.nationalgrid.com/uk/electricity/balancing-services/future-balancing-services>

## STOR and Fast Reserve Contract Review as well as review of exclusivity clauses

For each of our reserve services there are Standard Contract Terms (SCTs) which apply to all providers, and Framework Agreements which are individual to each provider. The SCTs by their nature must include all the information for all types of providers in all situations. As the service has developed over the years, more information has been added to the SCTs to cover new types of provider or new situations for the service. Feedback from smaller providers has been that these contractual terms are now very complex and in some cases do not accurately reflect their understanding of the service requirements.

We are therefore reviewing and simplifying the existing SCTs to aid clarity and remove ambiguity. The aim of this is to simplify the language and the length of contract, clarifying rights and obligations of all parties. We will also be using this opportunity to consider the feedback on specific clauses that we have received from parties through bilateral discussions. We will engage with industry on the new proposed contracts in Q2 2018

(following the review of contracts in the FFR market) through the consultation process defined in the SCTs.

As part of the contract changes, we will also be reviewing the exclusivity clauses which currently prevent parties from providing other commercial services to third parties as outlined in the Frequency Response section. This work will be both an SO roadmap deliverable and an Energy Networks Association deliverable under the Open Networks Project<sup>7</sup>, facilitating the emergence of the DSO model. This review of exclusivity clauses is particularly important as DSOs manage increasingly constrained networks which in turn prevent parties from being able to offer multiple services to multiple market participants. This applies to the provision of reserve services in the same way as it applies to the provision of frequency response.

We will engage with industry on recommended changes at the end of Q3 2018.

## Standardisation of STOR and Fast Reserve

We reviewed the existing STOR and Fast Reserve markets to identify any parameter, tendered or fixed, that may have an impact on the value of parties' tenders. Those parameters were then split into ones which could be more tightly defined into separate product types to aid transparency, and those for which splitting would not increase market transparency at

all, or not without significant work. As a result of this review, we identified one area in each market which could be standardised in short timescales to facilitate transparency. These were:

- STOR: the initiation speed; and
- Fast Reserve: the term of the contracts.

<sup>7</sup>The ENA project is examining how the roles of the SO and the DSO will change in a world where there is greater interaction between parties at the transmission and distribution interface.

# Reserve

**STOR Initiation Speed:** The STOR market permits providers that are able to deliver energy with an initiation speed of up to 240 minutes. In practice, we use them for different reasons depending on whether they are faster or slower than a response time of 20 minutes. As a general rule, faster STOR meets our requirement for frequency recovery, whereas slower STOR is used for margin recovery (also known as replacement reserve). This means that if providers are faster or slower than 20 minutes they are considered differently in the assessment process, but not contractually or in the volume requirement we

publish. We are therefore going to separate out the STOR products into two groups based on the initiation speed: <20 minute initiation and >=20 minute initiation. This will increase the clarity around the market price and the SO's valuation of initiation speed in the STOR market.

**Fast Reserve Term of Contracts:**

In the Fast Reserve market, providers can tender in for a contract term of a number of months, from 1 month out to 10 years (Table 3.1). This variability introduces complexity in assessment of competing tenders that cover different time periods.

**Table 3.1**  
*Period covered by Fast Reserve tender – current situation*

Tender	Period covered by tender
Single month	To provide the service for a single calendar month. To be submitted by 1st working day of the tender month.
Multiple months	To provide for between 2 and 23 calendar months. To be submitted by 1st working day of the tender month.
Long term	To provide for between 24 calendar months and 10 years. To be submitted by 1st working day of the tender month.

We will therefore be changing our procurement to run separate tenders covering different time periods. It is anticipated that we will continue with a month-ahead tender every month, with longer time periods available every quarter, see Figure 2.3. We are also proposing to remove the Long Term contract term tender option until the implementation of TERRE and MARI, which will define what our specific SO products look like (see below for potential end state).

The impact of the above changes will be to reduce the number of possible tendered combinations from several tens of millions to several hundred, with a consequential increase in market transparency and clarity of market price. The standardisation changes will be delivered in Q2 2018. We will also be reviewing the definitions of within-day STOR windows to ensure that they align with the proposed new FFR windows, which are based on four-hour EFA blocks.



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## Platform for Ancillary Services (PAS)

A key difference between reserve products and frequency response products is the requirement for active despatch and real-time monitoring of the assets providing the service. Frequency response products are self-despatched depending on the system frequency, and therefore do not need this level of real-time control, whereas reserve products are despatched manually by the control room through an interface. Historically, this interface has been provided automatically through the EDL/EDT<sup>8</sup> systems and the STOR Despatch system. Both systems require dedicated communication assets, including ADSL cables, to be installed at a provider's site, and can take 9–12 months to install. This creates a barrier to market entry, and although there are manual workarounds for STOR (i.e. telephone despatch) these can create usability issues for the SO for large numbers of sites.

We are therefore implementing a new despatch and monitoring solution to support the end-to-end lifecycle of existing and future reserve

services, and reduce the barriers that smaller parties have in accessing the STOR and Fast Reserve markets. This work presents an opportunity to reduce the time needed by providers to get new assets to market through a replacement of the current hard-wired STOR Despatch System.

The first stage of the PAS programme will be in the form of hosting Fast Reserve during summer 2018. The platform itself will be a web-service based solution that will aggregate and summarise the reserve volumes available to the control room, coordinate despatch across a large number of connected assets and providers, and then provide a route for automated monitoring of delivery.

We intend to roll the platform out further into the STOR market later in the year. Ultimately our ambition is to replace the existing STOR Despatch System with a flexible, scalable and secure platform.

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<sup>8</sup>Electronic Dispatch and Logging / Electronic Data Transfer

# Reserve

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## Testing and compliance/performance monitoring policy published

The current testing process for STOR and Fast Reserve is built into the installation of the communications and despatching systems mentioned above. As we move to a new platform, we will need to update this testing and compliance approach, and align it with the work being done for the frequency response market to build in a greater focus on ongoing performance monitoring. As with frequency response, we will be working with industry to determine the granularity and frequency of data which will be needed for ongoing performance monitoring, thereby allowing parties to select their metering solutions.

The ongoing performance monitoring initiative will allow the SO to pull data from parties as and when needed and monitor the performance of parties against their contractual obligations. A structure for penalties will be proposed as part of this process. In Q3 2018, we will be publishing both the new testing and compliance policy and the performance monitoring policy.

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## Simplification summary

At the end of the simplification phase (Q4 2018), we will have more standardised Fast Reserve and STOR markets providing greater clarity and transparency to all parties. Providers will have more information on which to base their decisions. We will also have simplified contracts and clear clauses relating to the rights of parties in relation to the provision of multiple services to multiple market participants.

Finally, the ongoing work in relation to testing and compliance will have been extended to both BM and non-BM providers, providing a clear pathway for how testing and compliance as well as performance monitoring will be carried out for all parties.

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## Stage 3: Improvement

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### Auctions in Reserve Markets

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The existing procurement times for STOR and Fast Reserve work well for providers who can forecast and control their availability over weeks and months. For providers who could provide frequency response but who cannot forecast or control their availability (e.g. wind, solar, DER), the timescales of these markets represent a barrier to participation. Therefore moving procurement closer to real time will create a new opportunity for these parties to access the reserve markets, lowering barriers and thereby increasing competition.

Feedback through the consultation showed a strong preference for moving to day-ahead procurement of reserve products, to maximise the ability of providers to forecast their availability and maximise the number of opportunities to participate in the market. The SO wants to move its procurement timescales as close to real time as possible, and will be running a trial in the frequency response market initially. The proposed auction trial for

frequency response will test closer to real-time procurement and a pay as clear mechanism, but the lessons learnt will also be applicable to reserve products. Therefore, following the trial period, we will be reviewing the results and assessing the applicability of an auction approach, and if that assessment is positive we will be identifying how to take forward a rollout of auctions and closer to real-time procurement for reserve products. One of the key considerations will be how the procurement of reserve services interacts with the procurement of new pan-European Standard Products for reserve and replacement reserve, as well as the day-ahead energy markets.

Rollout of closer to real-time procurement in reserve services represents an opportunity for participation by new technologies, and lowers another barrier to market entry for non-traditional providers.

# Reserve

## European Standard Products for Reserve and Replacement Reserve

The European Electricity Balancing Guideline<sup>9</sup> (EB GL), which was formally adopted by member states in March 2017, is expected to enter into force and become European law in December 2017. The EB GL seeks to establish a pan-European balancing market through the creation of pan-European market platforms to facilitate the coordinated activation and exchange of commonly designed 'Standard Products'. This will give providers the opportunity to participate in within-day markets to provide balancing services to TSOs across Europe, not just in GB, opening up new sources of revenue and increasing competition.

### Project TERRE

The first of these Standard Products to be implemented will be Project TERRE (Trans-European Replacement Reserve Exchange), which will be a new replacement reserve product procured through an hourly auction. The product itself will be for delivery of positive or negative active power in 15-minute blocks with an initiation time of 30 minutes. This is currently being progressed through BSC and Grid Code workgroups (P344 and GC0097), and there will be a joint consultation on these two modifications in January 2018.

### Project MARI

The second Standard Product to be implemented will be Project MARI (Manually Activated Reserves Initiative), which will be a new reserve product procured through an auction every 15 minutes. The product itself will be for delivery of positive or negative active power for 15 minutes with an initiation time of 15 minutes. This is currently being progressed through a ENTSO-e workgroup, and there is an initial consultation open until 20 December 2017<sup>10</sup>.

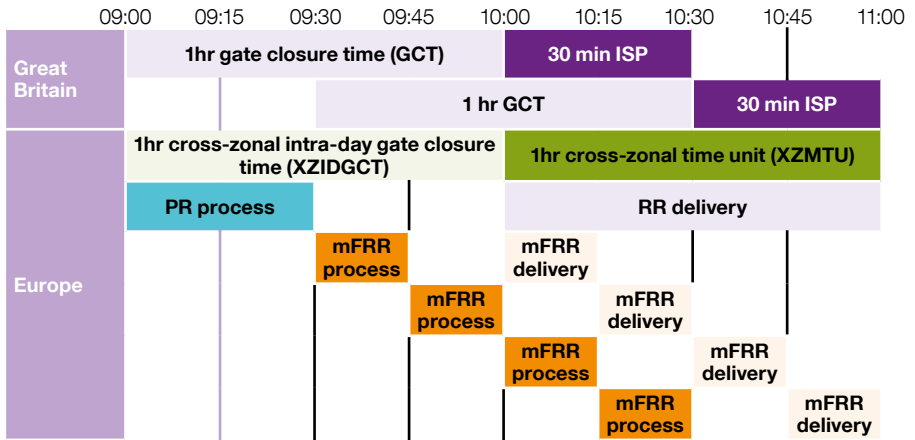
Figure 3.3 shows how these two pan-European auctions will interact with each other and the GB market; TERRE delivers Replacement Reserve (RR) and MARI delivers manual Frequency Restoration Reserve (mFRR).

The implementation of these new Standard Products will allow smaller and distributed players to compete on a level playing field with conventional generators on a pan-European platform, and will likely replace some energy balancing volumes in the BM and existing reserve products. Additional work is needed to understand the effectiveness of MARI as a potential reserve product.

<sup>9</sup> [https://ec.europa.eu/energy/sites/ener/files/documents/informal\\_service\\_level\\_ebgl\\_16-03-2017\\_final.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/informal_service_level_ebgl_16-03-2017_final.pdf)

<sup>10</sup> <https://consultations.entsoe.eu/markets/mari-first-consultation-call-for-input/>

**Figure 3.3**  
Proposed interaction between Balancing Mechanism and future European Standard Products



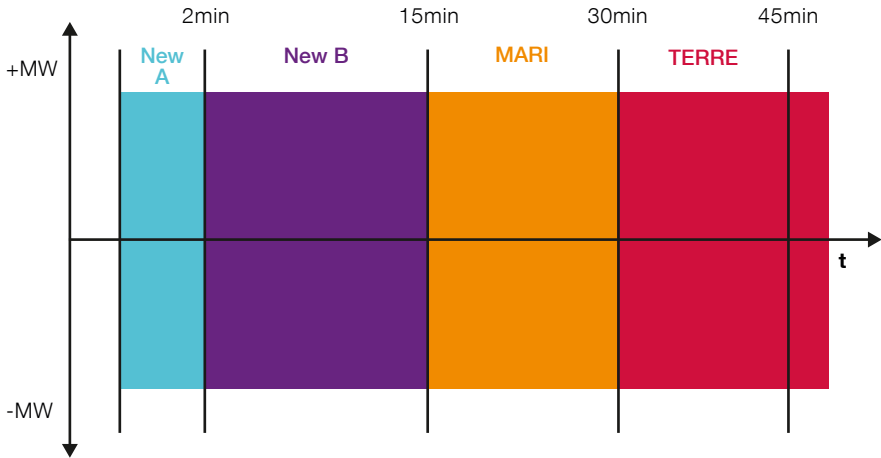
## Potential Future End State

The implementation of the European Standard Products TERRE and MARI may deliver benefits for the SO in accessing a greater pool of providers, and benefits for providers in being able to access a wider pool of buyers. However as these products overlap with the current reserve timeframes, there is a clear driver for us to review the suite of reserve and replacement reserve products more broadly. We are investigating how we should develop

reserve products around TERRE and/or MARI to ensure that any new reserve products interact in a holistic way and meet clear operational needs that can be communicated to the market. One way the future reserve products may look is illustrated in Figure 3.4, which shows the current Fast Reserve product but modifies the STOR product to accommodate the timeframes in which MARI and TERRE operate.

# Reserve

*Figure 3.4*  
*Possible End State reserve market*



Part of this work will also look at how we incorporate negative reserve services, which historically have been accessed almost entirely from thermal generators through the Balancing Mechanism. The demand turn-up service has shown how new parties can provide negative reserves, but we need to understand and communicate our requirement for these services to the market more clearly. The implementation of TERRE and MARI (which provide both positive and

negative reserves) and the additional specific reserve products required around those represent a great opportunity to deliver a coherent reserve market.

We will continue to investigate alternative approaches to addressing the issues with our balancing products and markets, and will work with industry to develop, test and refine the elements of this ambition over the next twelve months.

# Chapter four

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Other structural market changes

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# Other structural market changes

GB balancing arrangements are undergoing a significant level of change. The SO is committed to working with all parties to deliver access to a variety of revenue streams which allow assets to be used more flexibly. In turn, more functioning markets allow the SO to minimise the actions it takes.

There are structural changes which are being driven by European legislation and others which are being thought through and debated with industry in GB. This section provides an overview of structural market changes currently considered and their impact on market participants.

## Implementation of European Codes and wider access to the Balancing Mechanism

These changes relate to a number of different areas but are broadly associated with the implementation of European Guidelines and delivering broader access to the BM. The biggest changes currently being progressed by industry modification workgroups are shown here:

- **Implementation of Project TERRE into GB (BSC modification P344 and Grid Code modification GC0097)**
  - Seeks to implement the Replacement Reserve European Standard Product into the GB market by utilising existing BM/BSC processes to facilitate market participant access to the TERRE platform. This includes putting in place the arrangements to facilitate equal access to TERRE for both BM and non-BM participants.

- **Wider Access to the BM (BSC modification P344 and Grid Code modification GC0097)**

- As the two modifications to implement TERRE into GB put in place the arrangements for equal access for both BM and non-BM participants in TERRE, National Grid is seeking to utilise these modifications to also implement Wider Access to the BM. This in effect delivers the requirements of BSC modification P355 (BM-Lite), which has now been placed on hold, ensures consistent market access arrangements across both the BM and TERRE and avoids multiple workgroups tackling the same topic. Wider Access to the BM will be implemented alongside Project TERRE.

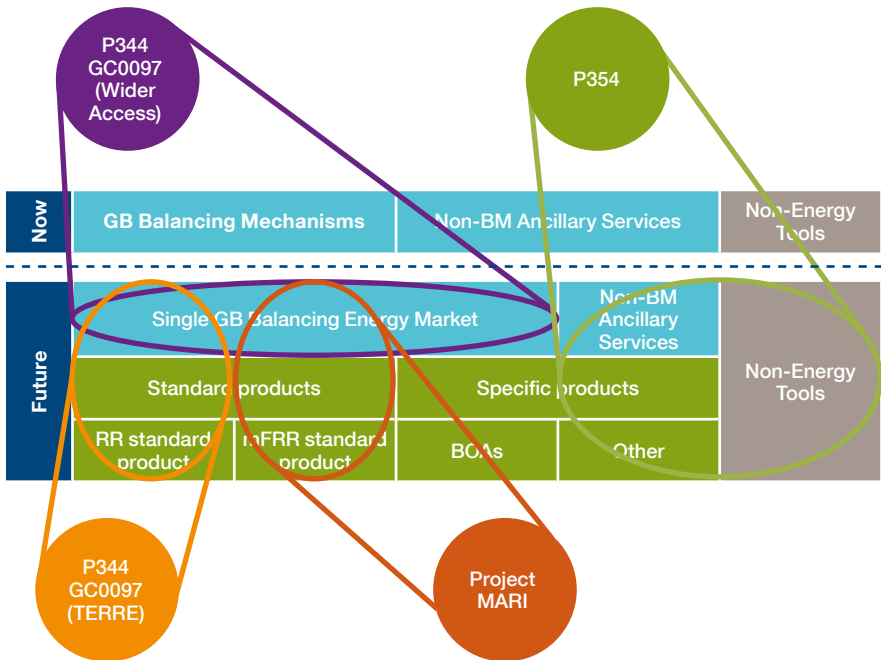
- **Removal of non-BM Spill (BSC modification P354)**

- Seeks to ensure that the SO can provide Elexon with delivered Ancillary Service volumes at a Metering System ID level to allow imbalance adjustment to be performed for all Ancillary Services, thereby removing spill payments for non-BM parties. This will level the playing field between BM and non-BM parties in the delivery of ancillary services.

There are a number of interactions between these mods, shown in Figure 4.1, particularly around market access for smaller players, such as embedded generators, aggregators and Demand Side Response (DSR).



**Figure 4.1**  
Overview of how TERRE, Wider Access and P354 fit together



P354 seeks to ensure a level playing field between parties providing services in the BM and TERRE, and thereby having their position or the relevant suppliers' adjusted based on the volume delivered to the SO, and those providing Ancillary Services outside the BM.

We therefore see a strong link between the implementation of P354, which seeks to deliver equal treatment, and the implementation of wider access to the BM P344/GC0097 in the provision of equal access to markets.

We believe that equal treatment of providers within and outside the BM should come hand in hand with equal access to the BM.

We encourage parties to get involved in the debates around those mods either through the consultations or through relevant workgroups and workshops.

# Chapter five

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Engagement and next steps

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# Engagement and next steps

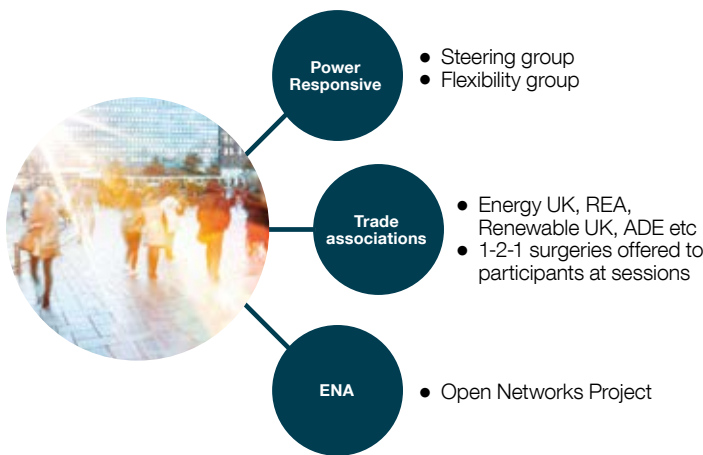
**This process of product evolution has aimed to engage market participants in a more agile way. We have deliberately moved away from organised workgroups in order to accommodate the needs of all our stakeholders, smaller players as well as larger entities.**

The SO started this process in October 2016 with a survey of market participants followed by intense engagement to really understand where parties felt that changes were needed. This engagement was carried out through the Power Responsive Campaign, trade bodies as well as conferences.

We used a new format of targeted engagement through the trade associations which allow for collective discussion through a workshop format as well as 1-2-1 surgeries to take place with members who requested those on the same day. The trade associations involved were Energy UK, ESN, REA, Renewable UK, the ADE among others. This enabled the SO to engage in a focused way but in a shorter space of time with a large number of market participants.

The SNAPS document consulted on what you told us needed to be transformed. We put together our initial recommendations together and in October engaged industry on those.

*Figure 5.1  
Engagement strategy*



We propose to continue with this format of collective workshop with trade associations followed by 1-2-1 surgeries. This will help us

to deliver the actions from the roadmap in a much more agile way.

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## Next steps

Both industry and the SO are faced with a lot of moving parts. The SO is gaining a broader understanding of its evolving needs and how these need to be tackled, as well as defining with other market participants how we all work together to allow providers to maximise the use of their assets.

Industry is dealing with a significant level of investor uncertainty due to regulatory, policy and commercial changes, some of which have been driven by the SO.

We hope that this roadmap starts to lessen this uncertainty. We clarify the concrete actions which the SO is taking in the short term, the principles it will adhere to in procuring its needs and the way we intend to work with industry in the future.

We also provide clear indications of what the end state for both Frequency Response and Reserve markets are likely to look like. The next deliverable you will see from the SO addressing flexibility themes will be a document outlining proposed next steps in the following service areas: reactive power, black start and constraints, in the first quarter of 2018.

We look forward to working with industry over the next few months in the delivery of this roadmap and on how we can all work together to further deliver functioning markets and value for the end consumer.

# Continuing the conversation

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Email us with your views on the Future of Balancing Services on: [futureofbalancingservices@nationalgrid.com](mailto:futureofbalancingservices@nationalgrid.com) and one of our experts will get in touch.

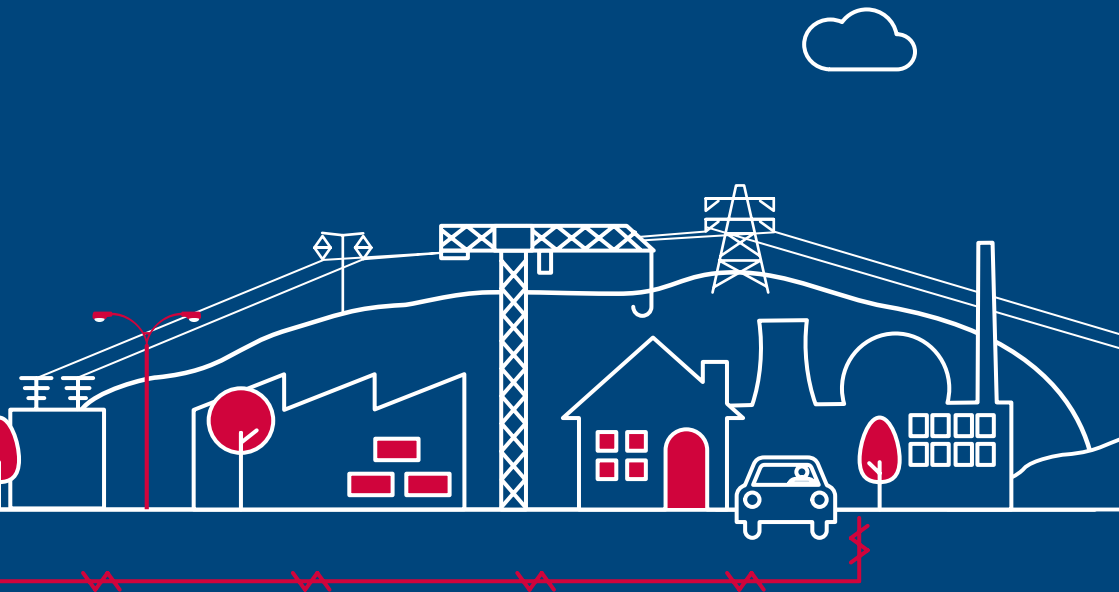
Access our current and past documents, data and multimedia at: <https://www.nationalgrid.com/uk/electricity/balancing-services/future-balancing-services>

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