nationalgridESO

# Response and Reserve Roadmap

03/12/2019

# Executive Summary

This document updates the plans of the National Grid Electricity System Operator (ESO) for the reform of our frequency response and reserve services.

Phase 2 of our Frequency Response Auction Trial launched at the end of November 2019 for procurement of up to 100 MW of both static and dynamic frequency response services. The auction trial is two-year project to test closer-to-real-time procurement of ancillary services in a weekly, pay-as-clear auction. We expect that the trial will facilitate non-traditional providers to offer frequency response services and therefore increase the liquidity of the response market. Over the duration of the trial, we will increase the volumes and number of products we procure.

We are developing a new suite of three dynamic frequency response services, which will eventually replace our existing response services. These services are designed to ensure the secure operation of a decarbonised, low-inertia, electricity transmission system. We are prioritising the development of our Dynamic Containment (DC) frequency response service, which is designed to be fast-acting and to operate post-fault. We will begin to procure this service before summer 2020. At the same time, we will progress with the modelling and design of the remaining two end-state products, Dynamic Moderation (DM) and Dynamic Regulation (DR). We will engage with industry early in 2020 on the design of the new dynamic product suite, on the future of static frequency response in our portfolio of ancillary services, and on the removal of barriers to market entry to enable diverse technologies and asset capabilities to provide ancillary services to us.

With respect to reserve services, our focus is on the standardisation of the existing service portfolio. We expect that our current implementation of the Wider Access to the Balancing Mechanism project, as well as the European-wide Project TERRE, will significantly change our requirements for reserve services, and we will therefore wait to observe the impact of these projects before consulting on the further reform of reserve services.

# Contents

# Introduction

Frequency Response and Reserve are essential balancing services which the ESO procures from industry providers to support the secure operation of the National Electricity Transmission System. Frequency response services ensure that deviations in system frequency are mitigated within seconds, while reserve services provide additional sources of power over longer timescales, in the form of either increased generation or reduced demand.

It is our priority to reform the design of these services to ensure that they are capable of supporting the operation of the electricity system carbon-free by 2025. We will make the market for these services more accessible by standardising their requirements, procuring them closer to real time, and using a single platform for the procurement of all frequency response and reserve services. We will continue to work towards alignment with the recast Electricity Regulation, also known as the Clean Energy Package[1].

We have set out these ambitions in our 2017 System Needs and Product Strategy (SNaPS) document[2], service-specific roadmaps, Forward Plan[3] and initial publications on the service designs. We have progressed with our reforms since the publication of these documents. Procurement of our Firm Frequency Response (FFR) service has been standardised to EFA blocks and aligned with month-ahead tenders, while the standard contract terms have been simplified. Our streamlined FFR testing guidance document was developed through industry consultation and alongside the Association for Decentralised Energy. The new FFR testing guidance has been operational since August 2019 and introduced the use of the Independent Technical Expert to prepare the testing certificate, which reduced the time the ESO takes to validate new assets from 4-6 weeks to 1-2 business days. We launched our Phase 1 Frequency Response Auction Trial in June 2019, and Phase 2 of the Trial in November 2019. We have progressed the analysis of the new suite of frequency response services, as described below.

This roadmap will update you on our further plans to reform frequency response and reserve services. It is our priority to give participants in the ancillary services market and other stakeholders a clear view of our plans, to enable their feedback and influence over market developments. Additionally, by clearly signalling our priorities, we support market providers to respond and adapt to market changes.

[1] https://www.nationalgrideso.com/document/153571/download
[2] https://www.nationalgrideso.com/document/84261/download
[3] https://www.nationalgrideso.com/about-us/business-planning-riio/forward-plans-2021

# Frequency Response Services

The ESO has two main priorities guiding the development of our new frequency response services. We will deliver a new suite of faster-acting frequency response services to support our operations as the electricity system is decarbonised, and we will react to market feedback and ensure that these new services enable a level playing field for all technologies to provide frequency response.

The continued growth of renewable capacity in the GB market has reduced the requirement for conventional generation on the system, and we have observed a consequential decrease in system inertia, especially at times of low demand and high renewable production. System inertia will further decrease as we move towards our zero-carbon 2025 ambition. As a result, a key priority in our roadmap is the development of new, faster-acting frequency response services to support our operational needs. We highlighted this need in our SNaPS document and subsequent publications. Our Operability Strategy Report[4] elaborates in more detail how our system need influences the development of new frequency response services.

To meet this need, we will replace our existing frequency response services with a new, integrated suite of services: Dynamic Containment (DC), Dynamic Moderation (DM), and Dynamic Regulation (DR). We have communicated our initial requirements and design for these services, most recently in our Future of Frequency Response publication in February 2019[5] . This publication followed series of public workshops with market participants in 2018 where we exchanged views about these services.

We plan to release Dynamic Containment as the first of our new end-state services, in order to meet our most immediate need for faster-acting frequency response. We will design this service to operate post-fault, i.e. for deployment after a significant frequency deviation. As such, the service will be delivered proportionally to frequency, have a very fast response time, and operate only when frequency is outside of operational limits. The service will secure both generation and demand losses. We will likely procure high-frequency and low-frequency versions of this service separately.

We are striving to begin procurement of this service rapidly. Following further modelling work on the system requirements, we plan to communicate further details on this service and engage with industry in a series of workshops in January 2020. We will report on our design and implementation plan for the service before the end of Q4 2019/20 and will procure the first volumes of the new service in Q1 2020/21.

The second service in our end-state suite, Dynamic Moderation, is planned to be effective in managing sudden imbalances. Providers will need to occasionally deliver rapid proportional response outside a defined band above and below 50 Hz. The third service, Dynamic Regulation, is designed to correct continuous but small deviations in frequency. Providers will not need to respond as rapidly as for the other services, but they must have a duration of service that supports continuous operation.

We are designing this suite of services to offer opportunities for market participation to a diverse range of technologies and asset capabilities, while recognising the value of faster-acting response services in supporting the operability of the electricity system. In Q1 2020/21 we will engage with external stakeholders on our vision for these end-state frequency response services and take industry feedback into our detailed implementation plan.

As part of the development of the new suite of frequency response services, we aim to ensure that their design enables procurement from diverse providers including variable generation, storage, and demand-side participants. The importance of this activity has been a consistent theme of stakeholder feedback. By attracting participation from such providers, we can support the decarbonisation of the economy. We will therefore publish our strategy on mitigating barriers to entry for frequency response services in Q4 2019/20.

[4] https://www.nationalgrideso.com/insights/system-operability-framework-sof
[5] https://www.nationalgrideso.com/document/138861/download

We had previously communicated, as part of our Frequency Response Auction Trial Project (see below), an intention to develop an interim suite of services: Low-frequency Static (LFS), High-frequency Static (HFS), Low-frequency Dynamic (LFD), and High-frequency Dynamic (HFD). We released the LFS service as part of Phase 1 of the Auction Trial. For Phase 2 of the Auction Trial, we released a standardised version of the FFR PSH service ("Dynamic Low and High"). We do not now intend to proceed with the development of the other three interim services (i.e. HFS, LFD, and HFD). Instead we have prioritised the development of the end-state suite (DC, DM, and DR). This decision will enable us to develop these enduring services more quickly and avoids fragmenting our procurement over a number of diverse services. It also avoids that participants must re-test their assets multiple times over the duration of our reforms.

We had also communicated, in our Future of Frequency Response document, our intention to develop a Static Containment service, as a complement to Dynamic Containment. We no longer intend to release this service as part of the end-state suite, and instead we are reviewing the role of static response within our portfolio for frequency response services. We currently use a range of different static services and it is our intention to migrate these where possible into the new dynamic response services or to reformed reserve services. We are mindful that a number of industry participants provide these services to us, and we will seek wherever possible to ensure that providers can transition to another frequency response or reserve service as we migrate the static response services to the new end-state suite. The future of static frequency response will form part of our engagement with industry in Q1 2020/21 on the enduring suite of frequency response services.

We will transition to the new DC, DM, and DR services by procuring increasing volumes of each after their release. At least some portion of these requirements will be procured using the auction platform that we developed for the Frequency Response Auction Trial. We do not expect Dynamic Containment to initially displace any requirement for our other frequency response services, and we will begin by procuring this new service in addition to our other requirements. As we continue with the roll-out of our other new services, we will gradually procure less of the monthly-tendered FFR service, and our intention is to phase out the monthly tenders for FFR by Q4 2021/22.

# Frequency Response Auction Trial

Our Frequency Response Auction Trial is a two-year project to trial the procurement of a portion of our frequency response requirements via weekly pay-as-clear auctions. The trial, which is partially funded by a Network Innovation Allowance, supports a core ESO Forward Plan deliverable to remove barriers to entry, promote competition, and deliver value for end-consumers. The trial is designed to demonstrate that closer-to-real-time procurement will remove a barrier to entry for participants who cannot accurately forecast their availability to provide frequency response over longer time horizons. We expect that this will promote competition and increase liquidity in the frequency response market, reducing our overall balancing costs and increasing value for the consumer.

By introducing a more rapid procurement cycle and standardised services, the Frequency Response Auction Trial facilitates a transition from our current monthly FFR tender process towards alignment with the Clean Energy Package and our RIIO2 ambitions of a single, day-ahead market for frequency response and reserve, procured via a single market platform.

Phase 1 of the auction trial began in June 2019, with the procurement of up to 100 MW of the LFS service in a weekly pay-as-clear auction with the ESO acting as the buyer and auctioneer. Over the duration of the Phase 1 trial, we observed an increase in participant interest in the auction and a corresponding increase in liquidity. As a result, we saw a reduction in the price of frequency response purchased for overnight delivery (EFA blocks 1 and 2) by 29% from July to October 2019. The Phase 1 trial, which continued until the start of Phase 2, has given us a better understanding of participant behaviour in a pay-as-clear auction.

Together with our auction administrator EPEXSPOT, we launched the first release of the Phase 2 auction platform and algorithm in November 2019. In Phase 2 of the Frequency Response Auction Trial, the ESO is the sole buyer in the auction while EPEXSPOT independently administers the auction and takes responsibility for all aspects of the platform and the matching algorithm. In the Phase 2 auction we are initially procuring up to 100 MW of a new, standardised version of the dynamic service that we currently procure in the monthly FFR tenders. Additionally, we continue to procure up to 100 MW of the LFS service on the Phase 2 platform.

The transition of our frequency response services to closer-to-real-time procurement is complex, and our preparations for the launch of the auction trial have been more challenging than we anticipated. For example, in our design of the pay-as-clear auction, we determined that each EFA block must be allowed to have a unique clearing price to achieve the most competitive price outcomes. However, this design feature requires significant changes to our settlement process for the tendered FFR service, which assumes that prices differ only between business days, Saturdays, and Sundays over the calendar month. Such impacts on our internal business processes have unfortunately delayed the schedule of the trial compared to our original ambitions.

During the auction trial we will gradually increase the volumes we procure beyond the initial 100 MW of each service. We will also test the impact of increasing the volume cap for each unit, currently set at 20 MW. Before we do this, we will ensure that there is sufficient interest and participation on the auction platform to provide appropriate liquidity for the target volumes. We must also first improve our internal business processes to handle the larger volume and intensity of data and to streamline data integration between the auction platform and our operational systems as a precondition to procuring a larger proportion of our frequency response requirements in the auction. We plan to review the initial volume requirement of 100 MW and the unit cap of 20 MW at the end of Q4 2019/2020. As we increase greater volumes of response on the auction platform, we will gradually reduce our procurement of other frequency response services, and in particular of the monthly-tendered FFR service.

We will issue a report on the Auction Trial, explaining how our learnings from the trial are informing our future developments, in Q2 2020/21.

We plan to continue the auction trial for 2 years, until Q3 2021/22. During this time, we intend to continue development of the auction, the platform, and our internal business processes. In addition, we plan additional specific trials, as follows:

- We will trial the procurement of unbundled low-frequency and high-frequency response services on or before Q3 2020/21
- We will trial residual auctions to optimise the procurement of different services using a value relationship. This trial will allow us to pool liquidity for different services on the auction platform, and thus ensure that participants in the auction have the greatest opportunity to have their offers cleared. We plan to release this capability on or before Q1 2021/22.
- We will publish a plan for a day-ahead response market, and consult on the enduring design of the auction, in Q3 2020/21. We will also continue to strengthen our internal process for participant onboarding, contract settlement, and control room integration. We will then trial day-ahead procurement of a small volume of service in Q1 2021/22.

As the auction trial continues, we will regularly communicate with you on its progress and outcomes in the Future of Balancing Services newsletter as well as in the Ops Forums. We will consult industry on the next steps for market development following the completion of the trial.

# Reserve Roadmap

Our reforms of the reserve market are focused on standardising our reserve services to increase market transparency, facilitate equal access to the market by a wide and diverse group of participants, and comply with changing electricity regulation.

The ESO has already commenced this journey. We have opened the Fast Reserve market to aggregated BMUs while reducing the entry requirement from 50 MW to 25 MW, and we have implemented simplified contracts in both the Fast Reserve and Short-Term Operating Reserve (STOR) markets. In addition, we have commenced the rollout of a number of other initiatives, as follows:

### Migration of non-BM STOR Providers to ASDP

We have commenced rollout of the Ancillary Services Dispatch Platform (ASDP), a new dispatch tool integrated into our control room core systems, for non-BM providers of STOR. This API communications and dispatch system will better facilitate the dispatch of in-merit non-BM STOR providers and remove the requirement for STOR assets to have dedicated ADSL communications lines installed. We are working closely with market participants to complete the migration of providers during Q4 2019/20.

### Wider Access to the Balancing Mechanism

We are progressing with our Wider Access to the Balancing Mechanism project. This opens the Balancing Mechanism to new participants who have a capacity of at least 1 MW. It introduces new concepts such as Virtual Lead Parties and Secondary Balancing Mechanism Units, which will allow new parties to participate, and create new revenue streams for existing providers[6] .

### Implementation of Project TERRE

Project TERRE is a new European-wide replacement reserve service which will allow GB providers to offer replacement reserves to TSOs across Europe. European providers will similarly be able to offer these services to the ESO. A derogation from the obligation to implement Project TERRE by the target implementation date of December 2019 was granted to by the French Regulator to RTE in France. As there is no benefit to launching this service in the GB market without the ability to link through France to the wider continental market, Ofgem has similarly granted a derogation to the ESO, until the earlier of 30 June 2020 or the date when RTE makes cross-zonal capacity available for this service[7].

### Fast Reserve

Our existing options to dispatch a fast-acting reserve service are currently fragmented across different services including the tendered ‘fast reserve’ service, optional reserve services, and some static response services. In order to open the fast reserve market to more transparency of procurement and activation, we plan to review these services to see how they can be harmonised, standardised and integrated into a single, dispatchable service.

To improve market transparency and competitiveness, we will trial the procurement of an additional 300 MW of fast-reserve via the monthly tender beginning in December 2019, for delivery in January 2020.

Additionally, we will consult on our plans to move optional fast reserve services into more competitive procurement and deliver a strategy outlining how we will increase competition in the provision of these services in Q1 2020/21.

### Design for Reformed Reserve Services

We expect that the result of the initiatives outlined above, in particular the new pan-European standard service TERRE as well as the Wider Access to the BM project, will increase the availability of reserve to the ESO. We therefore plan to assess the impact of the newly implemented services before we set out any further reform to reserve. Furthermore, the

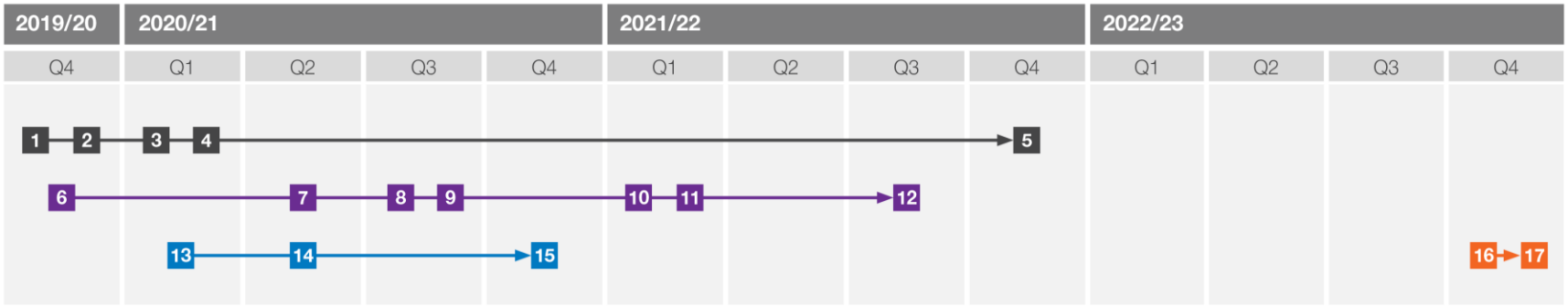
[6] https://www.nationalgrideso.com/balancing-services/wider-access
[7]https://www.ofgem.gov.uk/system/files/docs/2019/11/terre_ofgem_decision_to_grant_a_derogation.pdf

interconnected nature of frequency response and reserve services means that any work to develop new reserve services must first have a solid understanding of how the new response services will support the maintenance of system frequency, modelling for which is ongoing.

The recast Electricity Regulation (as part of the Clean Energy Package) will influence the development of standardised reserve services in future. Article 6 of the legislation promotes the move towards the procurement of balancing capacity contracts over day-ahead timescales and requires that utilisation prices should not be pre-determined in contracts for balancing capacity. Energy related to balancing, including for reserve services, should be settled on a pay-as-cleared basis. We will therefore consider how these requirements should be incorporated into our wider reform programme.

We plan to initiate market consultations on the further reform of reserve services after the impact of the above developments are clear to industry and to the ESO. This consultation will support our delivery of a proposal for reformed reserve services, including detail of how they will interact with both new frequency response services and TERRE, together with a plan for implementation. We will publish this proposal in Q4 2020/21.

# Timeline Infographic




**Frequency Response Services**

1. Report on design and implementation plan for Dynamic Containment
2. Publish strategy on mitigating barriers to entry for frequency response services
3. Release of Dynamic Containment sevice
4. Consultation on final design of end-state services, publish implementation plan
5. Phase out FFR service

**Frequency Response Auction Trial**

6. Review 100 MW requirement and 20 MW cap for the Auction Trial
7. Issue initial report on the Auction Trial
8. Trial separate procurement of LF and HF response services
9. Publish plan for day-ahead procurement and consult on enduring auction design
10. Trial residual auctions to optimise procurement of different services using a value relationship
11. Trial day-ahead procurement
12. Publish final evaluation of Auction Trial

**Reserve Markets**

13. Consult on strategy for more competitive procurement of optional fast reserve
14. Go-Live of Project TERRE
15. Study impact of completed reforms and consult on further development of reserve services

**RIIO2 Business Plan Proposals**

16. Single market platform for all services
17. Single day-ahead response and reserve market go live

# Conclusion

In this roadmap we have set out our plans for reforming our frequency response and reserve services. In all our plans, we adhere to a number of common themes: standardising our services, facilitating access to markets, complying with the Energy Regulation, and enabling the operation of the GB electricity system carbon-free by 2025.

We have already embarked on this journey, implementing some standardisations to our service suite and beginning our weekly Frequency Response Auction Trial. Within a year of publishing this document, we will be procuring the first of our new suite of frequency response services, procuring a European reserve service through Project TERRE, and developing, together with industry, our remaining reformed response and reserve services. These activities will result in fundamentally different markets for participants, which will drive value for consumers.

If you would like further information about the activities outlined in this roadmap, please contact your account manager directly, or alternatively e-mail commercial.operation@nationalgrideso.com or phone 01926 654611.

We look forward to working with you over the coming years as response and reserve markets evolve.

# Summary of Acronyms

| Acronym | |
|---|---|
| ASDP | Ancillary Services Dispatch Platform |
| BM | Balancing Mechanism |
| BMU | Balancing Mechanism Unit |
| CEP | Clean Energy Package |
| DC | Dynamic Containment |
| DM | Dynamic Moderation |
| DR | Dynamic Regulation |
| EFA | Electricity Forward Agreement |
| ESO | National Grid Electricity System Operator |
| FFR | Firm Frequency Response |
| GB | Great Britain |
| HF | High Frequency |
| HFD | High Frequency Dynamic |
| HFS | High Frequency Static |
| LF | Low Frequency |
| LFD | Low Frequency Dynamic |
| LFS | Low Frequency Static |
| PSH | Primary, Secondary, High |
| RIIO2 | Second price control (Revenue = Innovation + Incentives + Outputs) |
| SNaPS | System Needs and Product Strategy |
| STOR | Short Term Operating Reserve |
| TERRE | Trans European Replacement Reserves Exchange |
| TSO | Transmission System Operator |