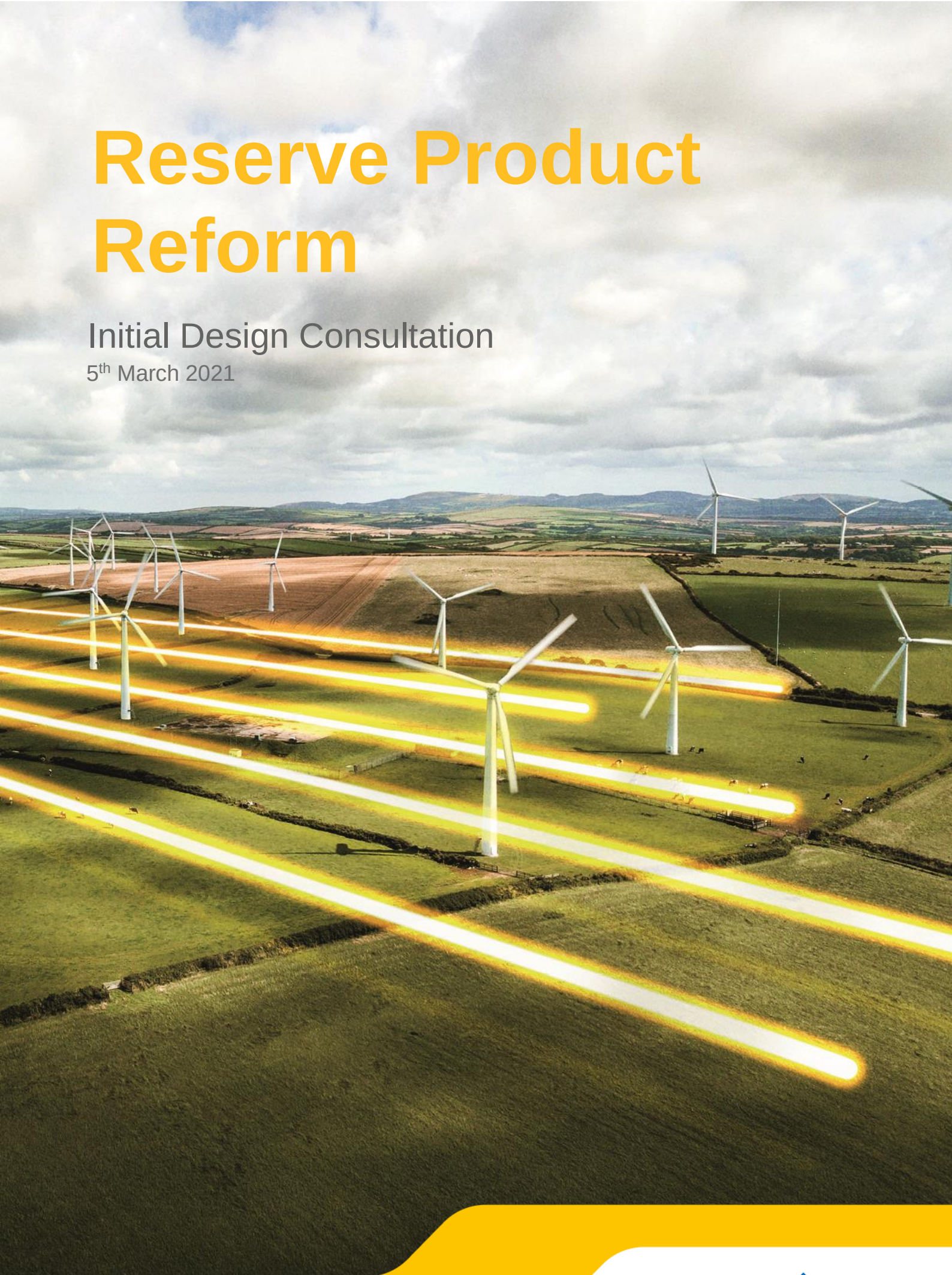
Reserve Product Reform

Initial Design Consultation

5th March 2021



nationalgridESO

Contents

Background

This document is a consultation seeking feedback and further stakeholder input on the initial product design concepts created by National Grid ESO. These designs have been co-created through discussions with the industry at a workshop on 9th December 2020, where we sought feedback on a strawman proposal for new reserve products. All documentation can be found on the Future of Balancing Services webpage https://www.nationalgrideso.com/research-publications/future-balancing-services.

Current state

Reserve is the capability to deliver upward or downward energy within a specified timescale on instruction. It is used to ensure that sufficient upward and downward flexibility is available to ensure the system can be operated securely. If the related energy delivery is required, it is manually instructed to deliver energy within gate closure timescales either to manage supply demand imbalances or after automatic frequency response services. Reserve can be either upward (an increase in generation/decrease in demand) or downward (a decrease in generation/increase in demand). 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.

Historically, upward reserve capacity has been procured through ancillary services markets which are run at month ahead or longer timescales to secure reserve capacity (STOR and Fast Reserve), via the BM or optional reserve products within gate closure timescales. Negative reserve capacity has been procured through the BM through the use of BOAs to reposition BMUs or via optional reserve products such as Spin Pump. In other words, the purpose of reserve service is to provide a hedge against the availability and cost of plant in the BM within gate closure. As such, they are used for similar purposes as the BM (i.e. providing Operating Reserve) but are procured ahead of time. The services we use have also, historically, been a route to market for providers who are unable to enter the BM but can offer a similar service.

How do we procure it today

The definitions of the current reserve products are loose and include areas where there is significant variability between providers. An example of this is the delivery time of STOR being defined as being within 20 minutes of an instruction, which in practice means that STOR is being provided by assets across a wide range of timescales. The availability windows which the products are being procured for are also variable, and change depending upon the season. For example, in 2020 weekday STOR availability windows change from 19:00-21:30 to 19:30-22:00 to 16:00-21:00, etc., all during a single year.

All of this variability between how different providers deliver reserve means that the products had to be procured through tender events, where providers' tenders are assessed against each other to identify the optimum result. Due to the manual nature of the tender assessment this process takes several days and requires considerable resource to run[1]. It also means that the assessment process is less transparent than an auction would be.

Additionally, there is no commercial market to secure availability for downward reserve outside of the BM, and there is a growing need to be able to access downward flexibility to meet changing operational conditions. This was demonstrated over the summer of 2020 where a temporary product (Optional Downward Flexibility Management) was introduced to support the system during periods of low demand and high renewables. There are also optional reserve products such as spin gen and spin pump which can be instructed within day through bilateral contracts and only involve a utilisation payment. These products deliver reserve, but also support the system by providing a level of inertia.

What does that mean we need to change?

In our System Needs and Product Strategy document of 2017[2] we set out key principles in relation to the procurement of products: simplification, standardisation and transparency. We consulted on different approaches to meeting those principles, and the feedback we received from the industry clearly indicated a preference for increased standardisation in our balancing services. There was also support for moving procurement closer to real time and to allow secondary trading of reserve products, both of which would

[1] Although there is work ongoing to move STOR procurement to day ahead it will still require a degree of manual intervention

[2] https://www.nationalgrideso.com/research-publications/future-balancing-services

require a greater degree of standardisation. These moves would make the products more simple and facilitate transparency in the markets.

Standardisation of reserve products will not only bring greater transparency to the market, it will also allow the necessary automation of procurement required for day ahead auctions to be run. Day ahead procurement will not only allow providers to better forecast their availability and arbitrage between other markets, it will also allow the ESO to procure reserve to more closely meet the daily requirement. Negative reserve products will provide the ESO with additional tools to manage the changing network conditions, whilst providing routes to market for new technology types and new providers. These changes will also ensure that we are compliant with the requirements of Regulation (EU) 2019/943 (Electricity Regulation, Clean Energy Package).

What else is changing on the system

As we look to facilitate zero carbon operation by 2025 our operability gap indicates that we need to reform both our response and reserve services[3]. Part of this is the growing need for faster acting reserve services to cater for conditions of lower system inertia.

The conditions of summer 2020 will not be unique by 2025, they will be normal. So, the summer has given us a helpful insight into the future needs of the system and the actions we may need to take to operate securely. Typical low demands over summer were exaggerated by the behavioural effects of the national lockdown. On some days national demands were up to 18% lower than expected before the pandemic hit. These low demands influenced the generation mix provided by the market with much lower quantities of inertia-providing plant scheduled to run, as almost all the demand could be met by renewables and imports across interconnectors.

This reduction in system inertia increases our requirement for frequency response to catch any change before it exceeds limits, and also fast-acting reserve to recovery the frequency back to statutory levels. As part of our reform of reserve products, we therefore need to look at faster acting products that can address this need.

BM storage trial

In summer 2020 we undertook a series of trials to investigate how we could better use limited duration energy storage assets in the BM. One of the drivers for this trial was the lack of a commercial route for availability payments for this type of asset to ensure that they made themselves available for instruction within BM timescales. We believe that the introduction of new reserve products will allow this type of asset to more fully participate and offer their flexibility to the market, and as part of this work we will be further investigating how limited energy assets can participate.

Summary of need

Taking the above into account, there are some key criteria that any reformed reserve products must meet in order to be successful. These are:

1. The products must be fast enough to recover frequency deviations in low inertia conditions;
2. The products must have sufficient duration to support the system until replacement energy can be delivered and reserves recovered;
3. There must be separate positive and negative energy products;
4. The products must be controllable such that unnecessary energy delivery is minimised to avoid unnecessary costs.

It is our intention that the fewest products required to fulfil the system needs should be created, in order to minimise operational and commercial complexity and maximise competition in the provision of the products. In designing our products, we will look to ensure that no providers are unreasonably excluded from participation. We note that more participation, and hence competition, drives better end results and costs for consumers.

[3] This is discussed in more detail in our Operability Strategy Report 2021: https://www.nationalgrideso.com/document/183556/download

Product Design

This section details the initial product designs and their proposed technical characteristics. These designs have been co-created with the industry through a workshop on the 9th December 2020 and have been tested against the key criteria outlined above. We are proposing two new products, both of which will have positive (upward reserve) and negative (downward reserve) variants.

Quick Reserve

Manually activated	LF/HF Trigger
0-minute notice to deviate from baseline	0-minute notice to deviate from baseline
Full delivery within 30 seconds	Full delivery within 30 seconds
1-minute extendable full output blocks, maximum of 20 minutes, cancellable at any time	
30-second ramp back to baseline, option to set slower ramp to bridge into next product	

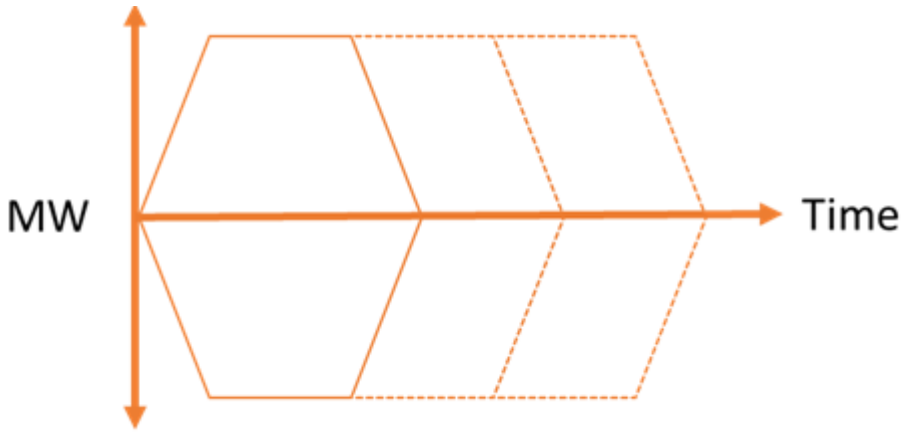


Figure 1: A representation of upwards and downwards dispatch of Quick Reserve, showing two 1-minute extensions.

Quick Reserve is a fast-acting reserve product which is intended to bridge the gap between the new frequency response services of Dynamic Containment, Dynamic Moderation and Dynamic Regulation, and the slower reserve product(s).

It is proposed to be manually activated, however to also have the option to be armed on a HF/LF trigger, i.e. the positive product would have an LF trigger option and the negative product would have a HF trigger option. There are flexibility options here: both in allowing the control room to vary the amount of MW armed and disarmed as they wish throughout the day and allowing the control room to adjust the frequency deviation that will trigger delivery from the asset. This fast-acting product would meet two operational needs: firstly to recover the system frequency after significant deviations (which would require a HF/LF trigger), and secondly to manage supply demand imbalances as a result of very sudden changes, such as demand pickup, wind cut out, or compounding interconnector ramping (which would require manual instruction). The HF/LF trigger output would be set to reach full output in 30 seconds, to support SQSS frequency standards.

We are also proposing that the trigger frequency be able to set by the control room within day, to enable maximum operational flexibility. We appreciate that this may impact on providers, both operationally and commercially, and would welcome feedback on this proposal.

Consideration was given to making the timing of this product (30 second ramp) slower, either 40 second or 60 second ramp. The trade off in this decision is between making the product slow enough that it can be manually instructed (where needed), versus making it fast enough that it can pick up frequency recovery. A further consideration was that the introduction of a slower product (~60s) may require the creation of a fourth frequency response product to bridge the gap during recovery from frequency events. This would further increase complexity for providers and the ESO, whilst reducing competition through splitting up reserve markets into more products.

You said:

"New assets can respond quickly and for longer duration so need to reward this. Extension options seems to do this"

The product is designed to be extendable at a 1-minute granularity for up to 20 minutes in total, giving the control room engineer fine control over how long the product should be delivered for. The 20-minute limit to this product has been selected to handover to the slower reserve product. It meets several requirements, some definite such as ensuring a controllable handover to the new Slow Reserve product (and the existing STOR product during the transition period), some speculative such as ensuring a controllable handover to a future MARI-type product (though this is not immediately expected due to the trading cooperation agreement). We are not proposing to include recovery periods as we want to ensure that we are not eroding our reserve holding through the utilisation of reserve products, i.e. to avoid the situation where we have less reserve than we need because some assets are in a recovery period and are therefore unavailable.

Consideration was given to fixed duration products following feedback from the industry workshop. The benefit in moving to such an approach is that it would align with the European Standard replacement reserve products TERRE and MARI. However, there are costs associated with introducing fixed duration products, as they require systems changes to automate the chaining of instruction of the products, reduce the transparency of decision-making, and increase operational risks in the event of imperfect ramping handovers. A further consideration is that allowing assets to segue from one product to another erodes the available capacity of the first product in the event that it is needed to be instructed again (e.g. if 30% of our Quick Reserve capacity was instructed and moved to delivering a slower product and we needed to instruct Quick Reserve again, we would only have 70% of the procured capacity available).

As a result of the current uncertainty surrounding the participation of GB in TERRE and MARI, we therefore believe that the impacts associated with fixed duration products outweigh the benefits at this time.

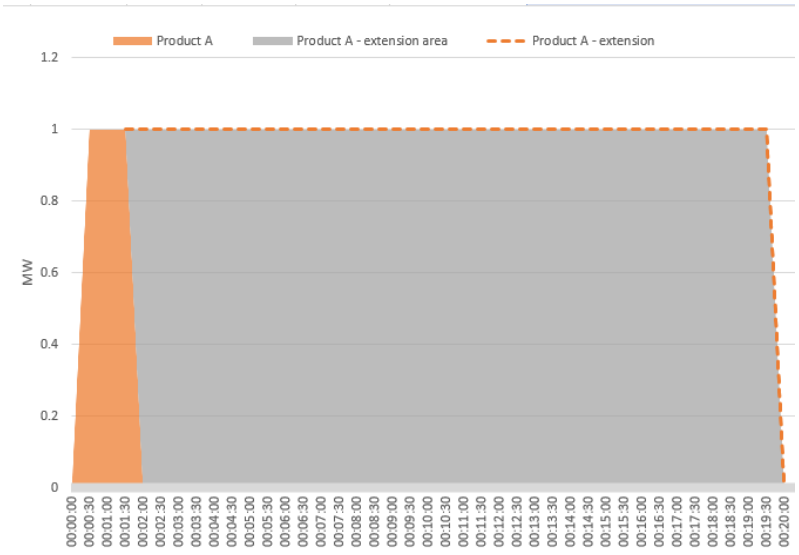


Figure 2: A calculated upwards dispatch of 1MW of Quick Reserve, showing initial dispatch and extension out to 20 minutes

Who could provide Quick Frequency Restoration Reserve?
Assets providing the outgoing Static Secondary product that is currently procured through the FFR market, and sites providing Fast Reserve including spin gen and spin pump products. We also hope that wind, solar and storage assets could find these products technically feasible, although some asset control system updates may be required to accommodate manual dispatch and instruction extensions.

Slow Reserve

Manually activated
10-minute maximum notice to deviate from baseline
Full delivery by 15 minutes from instruction
1-minute extendable full output blocks, up to 240 minutes
5-minute ramp back to baseline, 10-minute option would retain compatibility with TERRE

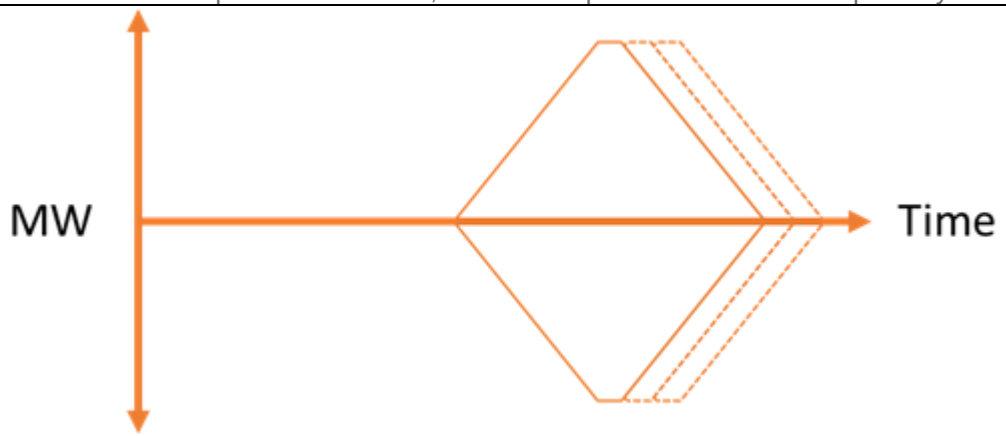


Figure 3: A representation of upwards and downwards dispatch of Slow Reserve, showing two 1-minute extensions.

You said:

"Is there scope for some notice time (e.g. 2 mins) and a bit more time to ramp to full for reserve products?"

Slow Reserve is a manually activated reserve, intended to manage short notice supply demand imbalances and transition frequency recovery into BM timescales. Visible deviation from baseline must occur within 10 minutes of instruction, reaching full delivery by 15 minutes from instruction.

It is designed to reach full output within 15 minutes due to line rating overload timescales (which allow lines to be overloaded for up to 20 minutes for operational reasons). Providers may start to ramp earlier, but they must achieve maximum output within 15 minutes of instruction. Consideration was given to using a 20 minute output period to match with STOR, however this would require fast acting reserve assets to maintain delivery for longer during frequency recovery (which is likely to have a higher cost of utilisation). Furthermore, market intelligence indicates that the vast majority of current STOR assets deliver within 15 minutes of an instruction, so we do not believe there would be a large impact on existing providers.

The product is designed to be extendable at a 1-minute granularity for up to 240 minutes, giving the control room engineer fine control over how long the product should be delivered for, without committing to unnecessary costs should a shorter activation period be required. The maximum duration of 240 minutes has been proposed to provide sufficient endurance to bridge the gap until an 89 minute replacement plant can be

instructed through the BM and provide useful output (89 minutes is the maximum Notice to Deviate from Zero time allowed). This also allows for compatibility should we gain access to TERRE, whereby a Slow Reserve order can be ended and timed to align with a future TERRE activation. The 10-minute ramp back to baseline option would ensure a continual power output.

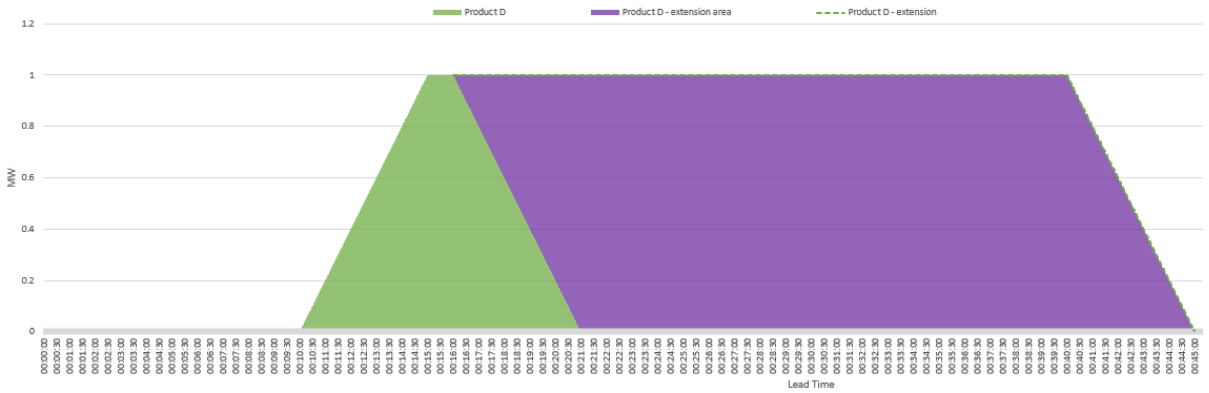


Figure 4: A calculated upwards dispatch of 1MW of Slow Reserve, showing initial dispatch and extension out to 45 minutes

Who could provide Slow Reserve?

Assets who have provided STOR or Fast Reserve. We also hope that sites that have previously provided ODFM, such as wind, solar and DSR could find these products technically feasible, although some asset control system updates may be required to accommodate dispatch and instruction extensions.

Service Design

This section covers our initial proposals for how the products will be procured and dispatched.

Procurement

You said:

"Procuring by HH period day ahead will give more assets a chance to join market"

"A day ahead market is essential for renewable providers - short term delivery is an advantage"

"A day ahead market setup … is essential"

We intend to run a day ahead auction for the new reserve products. Shifting to day ahead procurement presents the opportunity to vary procurement volumes based on uncertainty and move away from the historical distinction of unsynchronised standing reserve (such as STOR) and synchronised reserves (such as BMUs). We are also reiterating our commitment to allowing participation from assets down to 1MW in size.

You said:

"Settlement period windows would be ideal"

"Procuring by HH period day ahead will give more assets a change to join market"

"SP level granularity but with the ability to easily price blocks/whole day for those who do not want the flexibility"

"A day ahead market setup with hourly windows and an hourly settlement period is essential. (Or higher resolution -- e.g. 30 minutes)"

We are also proposing to auction individual settlement periods (SP). Currently STOR procurement is static at 1700MW, sized based on securing standing reserves to cover the largest loss, as defined in the SQSS. However, future products could have their procurement volume increased above the minimum SQSS requirement in particular settlement periods if additional uncertainty is identified at the day ahead stage. Whilst the BM may be able to provide sufficient volume in real time, a decision point would be available at the day ahead stage to secure firm access to additional reserves where there is a risk that margin may prove insufficient.

We expect the initial volume requirement on go-live of the new products to be a static national figure, that is then turned into a dynamic figure as forecasting systems improve to be able to provide true probabilistic uncertainty at day ahead, followed by the development of systems that can be used to calculate a dynamic reserve value. At present, our requirement for reserve capacity is not locational and therefore there are no restrictions on aggregation at the procurement stage, however it is worth noting that location is sometimes a consideration when dispatching reserve products. We will keep this under review as part of the work to improve our short term forecasting.

In order to ensure the optimum competitive outcome over all frequency response and reserve markets, we are considering the order in which we run the markets at day ahead. In theory, the market for the product with the most challenging technical parameters, and hence the most value to the ESO, should be cleared first, allowing unsuccessful assets to enter less technically challenging markets and so on. However, the ESO will have requirements to meet in all markets, and some markets could benefit from co-optimising bids between them. This will be further investigated by the response and reserve teams in tandem.

Dispatch

ESO decisions on whether to instruct reserve units to deliver energy is based on assessing the cost of utilisation against the cost of using the headroom and footroom available on those BMUs that are operating. At present, BM reserve are dispatched through the BM, while non-BM reserve is dispatched through the Ancillary Services Dispatch Platform (ASDP). This platform was developed as a means to both allow providers to participate in the STOR and Fast Reserve markets much more quickly (previously either telephone dispatch or dedicated ADSL lines were used), and also allowed the control room greater visibility and control over non-BM reserve units. ASDP was developed in conjunction with the industry, and successfully allowed greater access to reserve markets for non-BM parties. It also formed the basis for development of the wider access API for the BM.

You said:

"Instruction should be through the BM"

"Wider access API is very flexible and was useful in BM storage trial ... can we standardise around wider access API? Then it will integrate much better with the control room. The cost for generators is getting lower all the time"

"I'd only suggest that we encourage as many assets as possible to enter the BM which ensures that assets as much as possible compete on a level playing field"

Having a separate utilisation market for reserve products would mean that the ESO would need to co-optimise two markets in real time when deciding how to deal with sudden supply and demand imbalances. We are proposing that the merit order for dispatch of the new products is presented to the Control Room engineers in a single place, and that dispatch instructions for the products are delivered through a single mechanism. This mechanism must be integrated with BM systems such that reserve instructions are considered holistically with other options.

You said:

"For reserve services with a much more diverse range of technologies … a Pay-as-Bid approach would satisfy the ESO's reserve volume requirements economically"

"Merit-order despatch from a potentially large Reserve holding will require clear price differential on the Utilisation price, not possible or economically efficient if procured Pay-as-Clear. Therefore Pay-as-Bid become more compelling for Utilisation element"

We believe that utilisation payments should be pay as bid as this is essential if utilisation of reserve products is to be fairly considered against utilisation of reserve available BMUs. We appreciate that this is dependent on Ofgem granting a derogation against the requirement for payments for Balancing Energy to be pay as clear, and we will be progressing with this derogation request prior to a statutory consultation.

Other Considerations

Inertia products

The optional products spin gen and spin pump provide reserve availability at the same time as inertia, which is a characteristic of synchronous plant that provides stability to the network. The inertia is delivered during the availability period, regardless of whether or not the asset is instructed to deliver reserve energy.

You said:

"Value of inertia needs to be recognised"

"How would the inertia capacity of optional fast reserve interact with the Inertia Pathfinder?"

"Inertia-provision should be included in the assessment process"

"Separate, stackable markets for reserve and inertia"

"Energy + inertia is more valuable than just energy. This needs to be reflected in any market/product design and the assessment"

"Need separate markets for inertia and reserve then assets can stack these"

"Ideally the ESO should procure reserve and stability separately … The second best option is probably to procure 3 separate services … Stability, Stability + Reserve (basically Spin Services) and Reserve"

In order to value the inertia capability within the availability payment, a key precondition is the ability of the ESO to forecast inertia requirements at day ahead when the market runs. The Electricity Balancing System (EBS) identifies likely inertia levels at day ahead, however the actual need for inertia depends on which plant are planning to operate which only gets finalised within day. This means there is still significant uncertainty at day ahead as to the requirement for additional inertia. Investigation into how the ESO uses spin inertia backs this up and shows that spin gen / spin pump is mainly used within day (4-6 hours ahead of time) to offset plant or in the event of a trip.

We are therefore proposing to take forward reserve product reform without including a new reserve with inertia product, and to progress the valuation of inertia through the stability market work which is being developed in parallel. This will allow the stacking of reserve and inertia products. We are currently working with partner organisations to scope a Network Innovation Allowance project to investigation market designs for stability and will be communicating more information on this later in 2021.

ODFM

The temporary ODFM service that ran through summer 2020 and is being proposed for summer 2021 operated on a week ahead basis, with providers being instructed to deliver at day ahead. This was a pragmatic decision at the time in order to maximise participation during a period of unprecedented system need, when there were no balancing services delivering negative reserve. However, it does not fit with the requirements for a reserve product to be able to function within operational timescales in order to manage unexpected supply and demand imbalances and to recover system frequency following a fault.

We anticipate that ODFM providers who only provide MW reduction will participate in the new negative reserve markets, as there has previously been no route to access for this sort of service (e.g. wind turn-down). Other ODFM providers will explore the wider access API route to participate in other existing markets, such as the BM or reserve, and will invest in the necessary control and communication systems required. Those assets for whom such investment is not possible for commercial or technical reasons are more suited to constraint management services, which are there to manage locational issues on the network at day ahead or

beyond. For these assets we are developing local markets in conjunction with DNOs through the Regional Development Programme[4] work. RDP markets will operate at more than day ahead and will use appropriate systems and processes such as existing ANM schemes to control and dispatch assets, and therefore will be more accessible for these types of providers.

Active Network Management

Active Network Management (ANM) schemes are used by DNOs to manage capacity on their networks dynamically and maximise embedded generators' access to their networks. However, because these schemes can automatically control generators' output, they can in certain circumstances interfere with the delivery of balancing services such as reserve.

At present we will be continuing with the same approach as being used for STOR; if assets have a condition in their DNO connection agreement whereby they are signed up to an ANM Scheme or Flexibility Connection then they cannot participate in the new reserve markets. We will consider this on a case by case basis and may enable such participation if there is reasonable evidence to demonstrate that the asset has very high forecasted availability (for example as shown by Curtailment Assessment Reports from DNOs).

We are working closely with our colleagues in the DNOs to explore how assets within these schemes can better participate in balancing services markets, and as recommendations are made through the Open Networks[5] and innovation projects[6] we will look to take them forward.

[4] https://www.nationalgrideso.com/research-publications/regional-development-programmes
[5] https://www.energynetworks.org/creating-tomorrows-networks/open-networks
[6] https://www.smarternetworks.org/project/nia_ngso0035

Future Concepts

We are exploring new ways of thinking about reserve which we hope could improve the new products for providers in the longer term. These concepts are unlikely to be implemented from the launch of the new reserve products, as they represent more ambitious developments. We welcome views on them, however, particularly around how they might affect different technology types and market behaviours.

Dispatch: Order energy as a relative deviation from a forecast baseline

Currently, energy is acquired when assets are dispatched to a new power output level through the instruction of reserve products; large assets directly, and small assets via a tool that multi dispatches on behalf of the control room engineer.

The products outlined do not need to represent an asset's dispatched power profile from a 0MW output position, they can represent blocks of delivered energy due to deviations away from the asset's infeed/outfeed state. Assets could provide ordered blocks of energy by deviating from their forecast baseline, and passing through 0.

That baseline does not need to be at a steady state power output. Examples include a thermal plant moving between SEL & MEL and deviating away from existing ramp temporarily, or a storage asset sitting in a discharge state reducing discharge rate or crossing 0 and starting to charge upon request. Availability could be reconsidered in this approach, whereby a charging battery's available MWh of reserve could be accessed in operational timescales by both discontinuing the charge state and further discharging, proving an effective reserve greater than its capacity.

Distributing ordered blocks of energy at 1MW/min granularity

To equalise dispatch opportunities between large and small assets, an energy order can be broken down to 1MW/min granularity chunks, or less. Each asset could submit a price curve per MW. An energy order can be fulfilled by finding the optimised minimal cost from the aggregate of all price-power curves that are being offered, by buying the appropriate volume of 1MW/min chunks from each provider over time (asset power output/input bounded by constraints) and stacking the resulting energy orders together to achieve the final overall desired shape.

Consultation Questions

We are seeking views on all aspects of this document, however there are some key questions that we would welcome specific feedback on:

Q1: Do you believe that the product suite outlined will deliver open, transparent and competitive markets for reserve?

Q2: Do you agree with our choice of the two products to take forward out of the original four?

Q3: Quick Reserve – What are your views on the overall product design? Are there aspects which are unclear or have impacts that we have not considered?

Q4: Quick Reserve – What are your views on the different activation methods? Are there any consequences of having both manual and automatic frequency trigger set points that we have not considered? What are your views on having the trigger level change within day?

Q5: Slow Reserve – What are your views on the overall product design? Are there aspects which are unclear or have impacts that we have not considered?

Q6: What are you views on the effective minimum run time of 1 minute for both products? Are there any consequences that we have not considered?

Q7: What are you views on our proposal to progress with variable duration products over fixed? Are there other aspects we have not considered in our assessment?

Q8: Do you agree with the proposal to not include provision for recovery periods? If not, please provide views as to how the ESO could mitigate the issues of reserve erosion.

Q9: We are not proposing to include linking of bids, either for different settlement periods or different products. What are your views on this?

Q10: What are your views on the order of market procurement and interactions with future frequency response markets?

Q11: What are your views on utilisation payments, including whether they should be pay as bid or pay as cleared?

Q12: What high level requirements should we consider when developing a single dispatch and communication system for reserve?

Q13: Are there any areas where changes to could be made to improve access to the market for energy limited assets such as battery storage?

Q14: Do you agree with our decision to continue with spin gen / spin pump as optional products, and progress with a separate stability market outside of reserve product reform

Q15: ODFM – what are your views on our assessment of the ODFM market? Do you believe there are aspects which we have not considered?

Q16: Future concepts – What are your views on measuring dispatch of reserve against provider's baseline output, and what do you think the challenges and opportunities are?

Q17: Future concepts - What are your views on the potential introduction of utilisation price curves, particularly on what impacts it may have on smaller providers?

Consultation responses should be emailed to box.futureofbalancingservices@nationalgrideso.com by close of business on **2 April 2021** and be clearly marked "Reserve reform consultation response". All responses may be published by National Grid ESO unless market confidential in the response document.

Appendix

nationalgridESO

Appendix: Withdrawn Product Concepts

The following Reserve designs are not being progressed after internal and external feedback. They are included here for completeness.

Moderate Manual Frequency Restoration Reserve

Manually activated
3-minute notice to deviate from baseline
3-minute ramp to requested level
1-minute extendable full output blocks, out to 20 minutes
3-minute ramp back to baseline, option to set slower ramp to bridge into next product

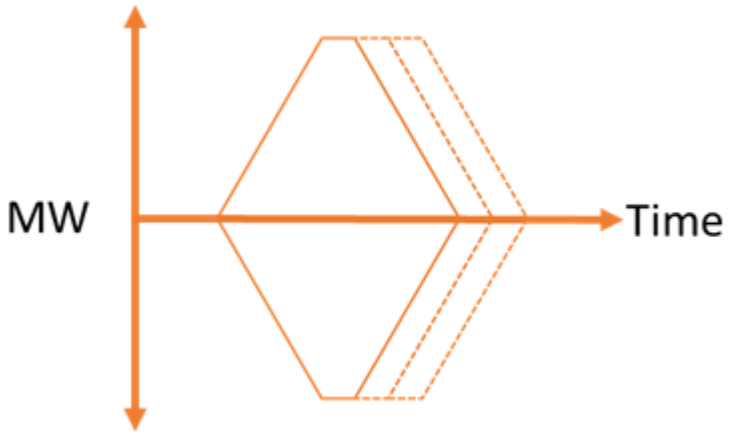


Figure 5: A representation of upwards and downwards dispatch of Moderate Reserve, showing two 1-minute extensions.

Moderate Manual Frequency Restoration Reserve may be required, if we are unable to secure sufficient firm volume to meet our risk appetite from Quick Reserve (due to fast ramping requirements), and optional BM volume does not fulfil that need. This slower product will capture assets that could come online more quickly than Slow Reserve, but cannot meet the high threshold for Quick Reserve.

This product has not been taken forward as it would be preferable to get all fast assets into Quick Reserve, and to use Quick Reserve alone to meet the system need. This will avoid complexity and splitting the market into multiple products.

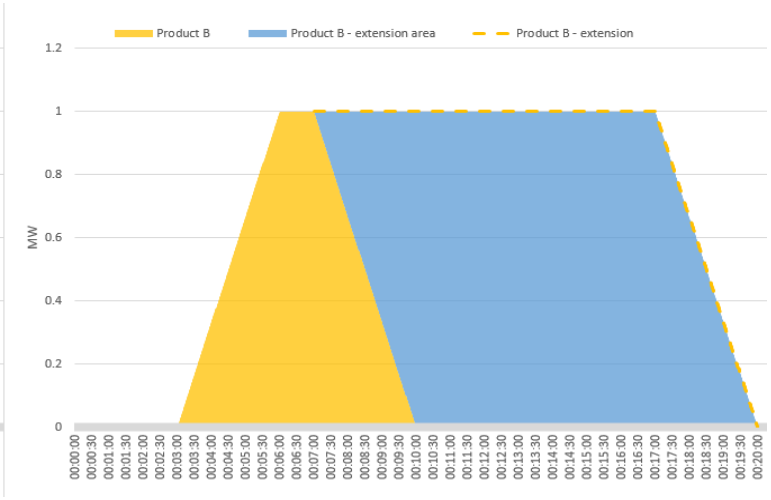


Figure 6: A calculated upwards dispatch of 1MW of Moderate Reserve, showing initial dispatch and extension out to 20 minutes

Product C

Product C (MARI-like)
GB Bidding Zone Reserve
Direct: 8-minute notice Scheduled: align to next 15-minute block
10-minute ramp up
5-minute fixed full output blocks
10-minute ramp down

Product C was designed to provide a variant of a MARI-like dispatch model (fixed trapeziums auctioned each 15 minutes), with the ability to procure firm availability at the day ahead stage and guarantee the chaining of fixed overlapping 15-minute blocks to create a long continual output.

This product has not been taken forward in light of the withdrawal agreement and the uncertainty over the introduction of MARI and TERRE in GB, and the overlap with the delivery period of Slow Reserve.

Faraday House, Warwick Technology Park,
Gallows Hill, Warwick, CV34 6DA

nationalgrideso.com

nationalgridESO