Public

Slow Reserve Service and Procurement Design Proposal

Version 1.0 - December 2024

Through our Reserve Reform work, NESO is updating the Reserve products we procure to comply with the Clean Energy Package and to better meet system and statutory requirements. Slow Reserve (SR) is primarily aimed at reacting to post-fault disturbances to restore energy imbalances to +/- 0.2Hz within 15 minutes of a loss event (generation or demand) and as such, will replace the legacy Short Term Operating Reserve (STOR) service.

Slow Reserve, consisting of Negative Slow Reserve (NSR) and Positive Slow Reserve (PSR), form part of a suite of new Reserve products which NESO are developing to maintain the safe and secure operation of the network.

We have now completed our initial proposed service and procurement design for the new Slow Reserve service, incorporating both BM (Balancing Mechanism) and non-BM (non-Balancing Mechanism) market participants.

We welcome industry feedback on the initial proposals before we proceed to the formal EBR Article 18 consultation in early 2025.

Public

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1. Introduction

Reserve is needed for frequency management when there is an imbalance between supply of energy and demand for energy. When instantaneous supply is not enough to meet the demand, the frequency falls; where supply outstrips demand, the frequency rises. Additional generation or demand is needed to re-establish this balance. Initially, this is provided by Frequency Response which initiates automatically according to system frequency. Reserve is then instructed to replace the energy delivered by frequency response in accordance with system requirements.

Slow Reserve (SR) is primarily aimed at reacting to post-fault disturbances to restore energy imbalances to +/- 0.2Hz of the nominal 50Hz within 15 minutes of a loss event (generation or demand). SR will allow NESO to better meet its system and statutory requirements following updates to the System Operator Guidelines (SOGL) standard. For Negative Slow Reserve (NSR), units are instructed to increase demand or decrease generation in full within 15 minutes. The inverse is true for Positive Slow Reserve (PSR). Slow Reserve is open to any technology with the ability to provide a net change in demand/generation of at least 1MW.

As already mentioned in the opening statement, Slow Reserve will ultimately replace the legacy Short Term Operating Reserve (STOR) service. Below is a table which highlights the key differences between these two services:

Requirement	STOR	Slow Reserve
Direction	Positive only	Positive & Negative
Service Windows	Seasonal variations, contracts for 2 windows a day of ~4 hours each. Must deliver for **min** 2 hours once instructed	2-hour+ windows throughout the day. Unit must be able to deliver for the full committed window
Operational day	05:00 – 05:00	23:00 – 23:00
Recovery Period	≤1200 minutes	≤30 minutes
Time to full delivery	≤20 minutes	≤15 minutes
Minimum Capacity	3MW	1MW
Baselining	From-zero	Non-zero baselines allowed
Payments	Availability + Utilisation	Availability + Utilisation
Metering	Every 60s (0.01667 Hz)	Every 15s (0.0667 Hz)
Aggregation	Allowed, nationally	Allowed, per GSP group
Procurement	Daily, D-1 with a further 400MW of legacy ‘long-term’ contracts	Daily, D-1

More information on our Frequency Response and Reserve services can be found on the NESO website.

2. Slow Reserve Transition Plan

The new Slow Reserve service will replace the legacy Short Term Operating Reserve (STOR) service and as we progress with the implementation of Slow Reserve, we have set out the key principles for how we intend to transition away from the existing STOR service.

- We will leave the existing STOR market open until December 2025 when the legacy ASDP and PAS platforms are retired.
- We believe all existing STOR providers will be able to provide Slow Reserve and we would expect all providers to transition over to the new service, however STOR and Slow Reserve will be operational together from September 2025 (subject to Slow Reserve EBR Article 18 consultation approval) to December 2025.
- We intend to phase out the procurement of STOR in line with the increased procurement of Slow reserve as we see providers transition over, and we will publish these indicative procurement volumes on our website with our other balancing services.

In the coming weeks, we intend to provide a more detailed transition plan, including a timeline and details of how providers will complete the transition from ASDP/PAS to OBP as part of pre-qualification for Slow Reserve.

3. Technical Design Summary

Technical Design Element	Proposal
Direction	Positive and Negative
Provider Eligibility	NBM & BM units with control/system telephony during contracted periods
Time to full delivery	Up to 15 minutes from instruction receipt
Minimum Activation Period	Not greater than 30 minutes
Maximum Recovery Period	Not greater than 30 minutes
Energy Requirement	The unit must be able to deliver the full contracted capacity per Service Window (a minimum 4 contiguous Settlement Periods)
Operational Metering	0.0667 Hz / once per 15s for both BM and NBM units
Dispatch mechanism	BOA for BM units OBP dispatch instruction for non-BM units
Notice to Start Ramping	Up to 14 minutes
Time to accept instruction	Up to 2 minutes
Ramp rates	Max ramp rate of 100% contracted capacity per minute. For max instantaneous ramp rates, unit cannot deliver more than 50% of contracted capacity in any 30s ramping period. Minimum ramp-up and ramp-down rate to be in line with Time to Full Delivery
Performance Metering	0.0667 Hz / once per 15s for both BM and NBM units
Performance Monitoring	Time to Full Delivery, Availability, Ramp Rates and Utilisation – Penalties for over (>120%) and under (<95%) delivery
Baselining	All providers will be expected to provide a nomination baseline, equivalent to the BM Physical Notification, with Final Physical Notifications 60-mins ahead of contracted Settlement Period. Both zero and non-zero baselines allowed.
Aggregation	Yes, per GSP group
Operational data requirements	BM units as per current BM operations Non-BM units to submit relevant operational data
Ramp rates for baselines	Aligned with Dynamic Response – no limit proposed
Passing through zero	Allowed

4. Procurement Design Summary

Procurement Design Element	Proposal
SR Window	Minimum 2-hours
Maximum Bid Size	N/A
Frequency of Procurement	Daily (day-head) – SR Contract firm procurement. Within day – optional procurement (non-BM only).
Locationality	National
Auction Platform	EAC
Auction Timing	Auction close by D-1 14:00 Results by D-1 14:30
Stacking & Splitting	Same MW cannot be sold twice. Please refer to Revenue Stacking section for more details
Bid Sizing	≥1MW, integer bids
Linking of bids	Allowed by Service Window and Product (Positive/Negative only)
Bid Curtailment Rules	User defined
Payment Structure	Firm: Availability + Utilisation Optional (non-BM only): Utilisation only
Payment Mechanism	Availability: Pay-as-Clear Utilisation: Pay-as-Bid

5. Technical Design

The key technical design features for Slow Reserve are:

- The service is open to BM (Balancing Mechanism) and non-BM (non-Balancing Mechanism) market participants.
- Minimum 1MW capacity of generation reduction/increase or demand reduction/increase from any technology. The unit can be a single asset or an aggregated unit (at GSP group level) comprising more than one constituent asset. For BM units the BSC aggregation rules apply.
- All Slow Reserve units must be able to;
    - Submit relevant service parameters, location, and prices (similar to the Balancing Code requirements).
    - Achieve full delivery of the contracted capacity within the submitted data, if instructed.
    - Be able to achieve full delivery of contracted volume in 15 minutes from instruction receipt or less, including acceptance time. Ramp rate limits apply.
    - Maximum allowed ramp-up and ramp-down rate for product delivery to be set at 100% of the contracted capacity per minute. For instantaneous ramping (for units that cannot ramp linearly), the unit cannot ramp more than 50% of the contracted capacity in any 30-second period.
    - Have both the Minimum Activation Period and a Maximum Recovery Period not greater than 30 minutes.
    - Submit Physical Notifications and Operational Metering.
- Units can be aggregated at GSP Group level to meet the 1.0MW minimum participation threshold, with location submitted during pre-qualification.
- There is no restriction on the maximum size a participating unit can bid up to. Contracts will be awarded upon acceptance of bids (SR Contract) in whole MWs (minimum 1MW) submitted into the daily auction.
- Providers with a SR Contract will receive an availability payment (£/MW/hour) and a utilisation payment (£/MWh) when dispatched.
- Providers are required to provide metering data with granularity no less than 0.0667Hz / once every 15s at a latency of no more than 5s. This inclusive of BM and NBM providers.
- BM units need to provide NESO with dynamic parameters which are defined in BC 1.A.1.5. Dynamic Parameters and Physical Notifications are to be submitted 24 hours in advance, with final notifications 60-mins ahead of gate closure and relevant price bands.
- Non-BM units must submit all relevant non-BM service parameters during all contracted windows along with Physical Notifications submitted at day-ahead, with final notifications 60-minutes ahead of gate closure and relevant pricing. For crossover purposes, non-BM units must also submit Availability, Final Physical Notifications, MNZT and relevant pricing post-contracted/optional windows for control room visibility and performance monitoring purposes.
- Stacking with other active power ancillary services will be limited for initial launch, stacking with the Capacity market and Balancing Mechanism are allowed. Units may only split their

Slow Reserve capacity with opposite Slow Reserve (e.g., Positive with Negative), Voltage and Stability services along with the Balancing Mechanism. Please see Revenue Stacking section below for NESO's revised stacking definitions and further information.

- NBM providers will have their energy position corrected through the ABSVD process.
- SR units will be performance monitored using performance metering data, at 0.0667 Hz/once per 15s, submitted after the contracted day to be evaluated on availability, ramp rates, time to full delivery and utilisation. If stacking with any other ancillary services or market, then the more granular metering is applicable and should be submitted to NESO.
- All SR providers have up to 2 minutes to signal to NESO that they have received and accept the SR instruction. The Time to Full Delivery is inclusive of this time to accept instruction.

Provider eligibility

To participate in the Slow Reserve market, providers must:

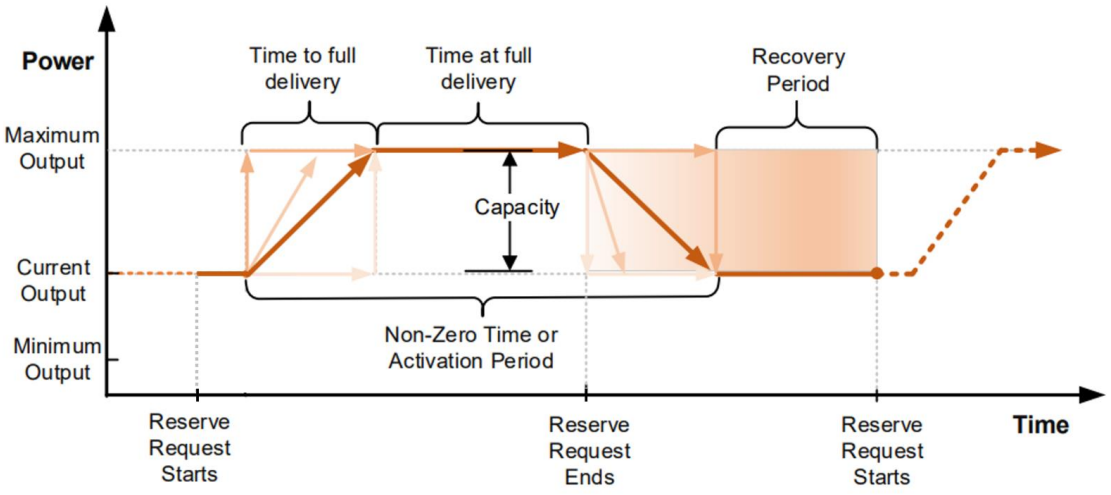
- be a BM unit; or NBM unit.
- have control telephony for the entire duration of an SR Contract Window, which could be Control Telephony or System Telephony as per Grid Code definitions. For non-BM this will require an operational telephone so that NESO can contact the non-BM unit to allow for dispatch during planned or unplanned outages of the OBP system interface. The requirement to have telephone control comes from the need to dispatch units by phone during planned or unplanned outages of the EDT/EDL system (or wider access equivalent) or OBP system.
- be capable of providing 1MW or more of reserve volume in line with the service design. Bids must be made in integer MWs.
- Complete the Slow Reserve pre-qualification registration process through our Single Market Platform (SMP).
- Non-BM providers will be required to complete onboarding to the Open Balancing Platform (OBP) as part of pre-qualification.

Both BM and non-BM participants with a connection to either the electricity transmission or distribution network will be eligible to provide Slow Reserve.

Service Utilisation & Dispatch Mechanism

Utilisation for BM units will be in line with normal Balancing Mechanism operation in accordance with BC2 via Bid-Offer Acceptances. Dispatch instructions to BM providers will be by way of Bid-Offer Acceptances (BOAs) via EDT/EDL or telephone instruction if required.

NBM providers will be dispatched via OBP system instructions. The Start and Stop instructions may be sent in advance, with effective date-time for action. A providers Control point will need to receive these instructions and only action at the specified effective date-time points.



Time to Full Delivery

The time to full delivery is recommended to be 15 minutes or less, inclusive of any notice to start ramping, i.e., NDZ and/or NTO/NTB or equivalent, and time to accept instruction. That is to say, the unit must be capable of reaching its full contracted output within 15 minutes of instruction receipt.

Notice to Start Ramping

Units participating in Slow Reserve, both positive and negative, should have a Notice to Start Ramping of no longer than 14 minutes from instruction receipt. This includes, where applicable, a unit's NTO, NTB and NDZ, or equivalent for NBM.

Time to Accept Instruction

NESO requires that a unit must send an acceptance of a Slow Reserve instruction within 2 minutes of receipt. This is to indicate to NESO that the unit plans to ramp to the instructed volume within the required 15 minutes. A unit's Time to Full Delivery is inclusive of this time to accept requirement.

Cease Time

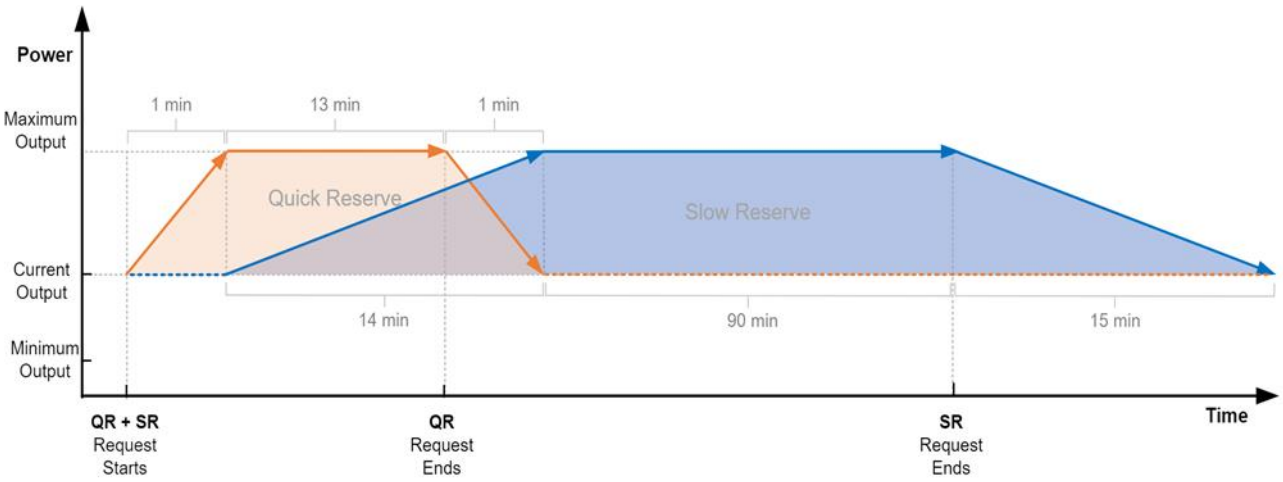
The cease time is defined as the converse of time to full delivery. That is, the time a unit takes for a unit to ramp down from a Slow Reserve request ending to its FPN. As can be seen in the infographic above, the non-zero delivery envelope is a symmetric trapezium, meaning the ramp up and ramp down times are the same. A unit can ramp however it sees fit, so long as it is bound within the defined activation envelope and maximum ramping limitations set out under the Technical Design section of this paper.

Minimum Activation Period

Minimum Activation Period is defined as the minimum duration for which an instruction can be issued, and it is specified by providers. Slow Reserve providers will be able to specify a Minimum Activation Period of between 1 and 30 minutes inclusive, which means that NESO can only issue an instruction for a minimum of between 1 and 30 minutes. This will facilitate enough flexibility in

dispatching and ceasing units to respond to the operability challenges while giving providers certainty about the minimum time that they can be dispatched. A typical usage of Slow Reserve is illustrated below.

Minimum Activation Period is inclusive of ramp to instruction, time at full delivery and ramp from instruction.



Slow Reserve energy requirements state that a unit should be able to deliver the full contracted MW capacity for the entire SR Contract. A participating SR unit should therefore be capable of delivering the service for any length of time between its defined Minimum Activation Period and the full offered continuous SR Service Window. Providers can offer capacity into the SR service for as long as they wish, provided it is in multiples of 30-minute Settlement Period blocks, with a minimum of 2 hours, and such that full delivery can be sustained for the entire offered duration.

Recovery Period

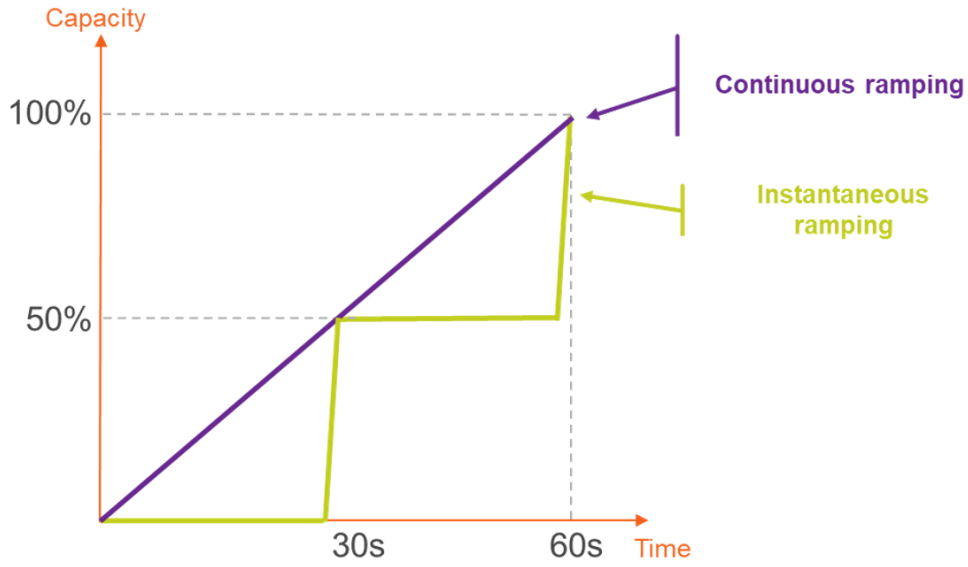
We propose a maximum Recovery Period for Positive and Negative Slow Reserve of up to 30 minutes. This means that an asset has 30 minutes to return to availability before NESO can send another dispatch instruction.

Ramping Envelope

It is proposed that within the ramping to instruction and ramping from instruction ramp rates, participating units must deliver Slow Reserve subject to the following elements:

- The maximum ramp rate limit is set at ≤100% contracted capacity per minute. For instantaneous ramping (for units than cannot ramp up linearly), the unit cannot deliver more than 50% of the contracted capacity in any 30-second period.
- The minimum ramp rate is directly set from the time to full delivery service design - the unit may not deliver at a rate of less than 100% per 15 minutes (minimum ramp rate). This applies to both ramp-up and ramp-down periods.
- The unit may start delivery immediately after accepting a dispatch instruction.

Example of a maximum acceptable ramping envelope – ramping to or from instruction – is presented on the figure below. The maximum ramping from the instruction is proposed to have identical envelope in the opposite direction.



Ramp rates for baselines for energy limited assets.

The Maximum Ramp Rate limits the rate of change of power for energy limited assets as shown by Performance Baselines. Previous Dynamic Response Service Terms stated a Maximum Ramp Rate of 5% of the contracted MW/minute. We propose removing this restriction for Slow Reserve.

We understand the Maximum Ramp Rate requirement has represented a pain point for participants, imposing an opportunity cost through constraining opportunities for wholesale market participation and more efficient state of energy management. We recognised this cost may have driven higher prices and ultimately caused costs to be passed on to energy consumers.

We introduced the Maximum Ramp Rate to protect against effects of herded energy recovery and Service Terms previously required units to recover their state of energy if they do not have enough energy (or capacity to import energy). Following a large high/low frequency event where units charge/export (respectively) to deliver the response service, many or all units may be required to recover energy at the same time. The Maximum Ramp Rate was to protect against the cumulative effect of such behaviour. We have carried out analysis, including modelling, review of historical provider behaviour, and stakeholder engagement, to consider the system security impact of changing or removing the ramp rate restriction. We concluded the benefits of removing the Maximum Ramp Rate likely outweighed the cost associated with additional actions to protect against herded energy recovery.

As the system operator, it is essential we take such decisions cautiously and we will continue to monitor participant behaviour and the effect of removing this restriction. Slow Reserve ramp rates for baselines are aligned with the Dynamic Response services. Ramp rates for baselines are therefore not required for Slow Reserve until such time as these requirements are updated for the Dynamic Response services, should they be required for system security purposes.

Operational data Requirements

BM units are required to submit operational data in accordance with current BM obligations.

Non-BM units must submit relevant service parameters, as defined within this document, and pricing during all SR Contract windows, and whilst providing the Optional Service.

Proposed non-BM data requirements and publication:

- Time to Full Delivery / Response Time
- Ramp-up rate
- Ramp-down rate
- Minimum non-zero time (MNZT)
- Recovery Time (equivalent to MZT)
- Availability (MW and Util Price)
- PN values
- Notice to Start Ramping (NTS) – Equivalent to NTO/NTB in the BM

In response to provider feedback and in the interests of data transparency, NESO propose to publish the above non-BM technical data on our data portal. However, we are keen to seek further views on this proposal.

Operational Metering

The operational metering requirement for Slow Reserve is set at once per 15s (0.0667 Hz), with a latency of no greater than 5 seconds. This not only aligns with the “slow” nature of the service but is also crucial for accurately monitoring the most onerous requirement- the maximum allowable ramp rate, which must not exceed 50% of the total contracted volume over any 30s period. To accurately monitor this requirement, NESO will require 2x samples per 30s period, which equates to once every 15s. This approach also aligns with the metering requirements for our legacy STOR service.

All operational metering, including active power and system frequency data, should be provided at an accuracy according to the relevant Code of Practice (e.g., 1.0% for assets >10MW & ≤100MVA).

BM providers should submit operational metering via the existing processes. Non-BM providers should submit operational metering via the new OBP system.

We recognise that some non-BM technology types, such as demand side flexibility, aggregators of smaller assets, etc, may wish to discuss how this data should be presented to NESO. Please reach out to us and we will be happy to arrange a 1-2-1 session.

Physical Notifications (Operational Baselines)

Physical Notifications are defined in the Grid Code as a forecast or an indication of the generation or demand levels a unit expects to operate at during specific periods. Physical notifications are required by NESO for real-time operational awareness, margin assessments and during the settlements process.

All providers will be expected to provide Physical Notifications. This is a forward-looking view of asset output and is locked in for the forthcoming two settlement periods at Gate Closure. This

provides operational visibility to the control room and acts as a datum against which performance can be monitored by Settlements.

- BM units are already required to submit Physical Notifications per requirements in the Grid Code. No additional requirement for the Slow Reserve service.
- Where a contract has been awarded, NBM units should provide Physical Notifications for the entire service delivery day (23:00 to 23:00) within which the contract/s is held, and should be submitted as soon as reasonably practical, but in any case, no later than 2 hours following the publication of the SR auction results.
- For crossover purposes, all units must also submit a Physical Notification for one settlement period after any contracted/optional windows within in the operational day.

For all contracted periods, non-BM units will be expected to provide a Physical Notification 60 minutes ahead of each settlement period/s contained within a contracted or optional period.

Both zero and non-zero baselines are allowed for all providers.

We recognise that some non-BM technology types, such as demand side flexibility, aggregators of smaller assets, etc, may wish to discuss how this Physical Notification data should be derived and/or presented to NESO. Please reach out to us and we will be happy to arrange a 1-2-1 session.

Submission of Operational Metering and Baselines

Through the recent formal EBR Article 18 consultation for Response services, NESO proposed the introduction of certain rules for all pre-qualified non-BM providers to submit operational metering and physical notifications (operational baselines) at all times, rather than just during contract service periods. This proposal included associated performance penalties applicable to both BM and non-BM parties, involving suspension from the applicable auctions for a fixed period. We were not able to provide a clear implementation date for this requirement and Ofgem rejected this proposal.

Given the recent decision from Ofgem, we may not be in a position to include this for the initial introduction of Slow Reserve, however, once we have the full IT system capability in place to performance monitor and apply appropriate penalties it is still our intention to implement this requirement.

We are therefore interested in feedback from all types of market participants, including non-BM STOR providers and other smaller or aggregated units, recognising that this requirement may be particularly onerous on providers who may only occasionally participate in the service. All feedback will be greatly appreciated and will help us understand the various IT implications, and we will give careful consideration before making our final proposals.

Proposed future requirement:

Once a non-BM unit is prequalified for the Slow Reserve service, they are required to submit operational metering and physical notifications (operational baselines) continuously – 24 hours a day, 7 days a week, 365 days per year regardless of whether they have a SR Contract, offering the Optional Service or are unavailable.

This requirement is applicable to both BM and non-BM participating units. In practice, BM units are already required to submit this data per requirements in the Grid Code, and we will consider

submission of Physical Notifications and Operational Metering per the Grid Code as conforming with this requirement.

The challenges of limited visibility of Distributed Energy Resources (DER) are well-established and through the NESO DER Visibility programme, we are developing a roadmap for fuller DER visibility. However, adding this requirement to the Slow Reserve service represents a practical and targeted way to accelerate the benefits of DER visibility.

We do not see this as a barrier to providers accessing this market, as Slow Reserve providers will already need the capability to submit this data (as a requirement during contracted service periods).

For clarification, we are not proposing penalties due to the inaccuracy of operational metering or operational baselines, other than those associated with contracted service periods, where we will deem participants unavailable where they do not submit operational data or operational baselines.

To ensure NESO is receiving the required data, in line with the recent Article 18 consultation for Response services, we are proposing to monitor data submissions. The acceptable submission rate is 80% of the time, measured on a rolling 28-day assessment period, calculated daily. If a provider has not submitted data in relation to a Reserve Unit for at least 80% of the time across 28 days prior to a particular service day, sell orders submitted for that unit on that service day shall not be valid.

We will calculate the submission rate for each set of data separately. That is, the provider must submit both operational metering and operational baselines for the unit at least 80% of the time; for example, a submission of less than 80% for operational metering cannot be offset by a higher than 80% submission of operational baselines.

For a newly created Slow Reserve unit, the assessment will be done on a cumulative daily basis for 28 days. At which point, the calculation will revert to a rolling 28-day assessment. Therefore, a newly set up Reserve Unit can participate in auctions before 28 days.

This requirement is applicable to both BM and non-BM participating units.

Performance Metering

All providers (BM and NBM) are required to submit data to NESO for real time availability and post-event performance monitoring. This data is required by NESO to ensure operational security of the network and through the monthly settlement process, to validate the performance where units are dispatched to deliver an instruction for the SR Contract and Optional SR services.

Data will be required for each operational day, for each unit awarded a SR contract/s. We are currently finalising the data and method for submission (e.g. API), and this will be confirmed at the earliest opportunity.

Performance Monitoring

Service Availability

We will monitor the availability of units in order to confirm that they are holding sufficient headroom/foot-room and can therefore deliver their contracted MW if instructed.

Through the monthly settlement process NESO will evaluate the conditions below for each contracted window, individually. Failure to deliver at 100% of contracted availability will forfeit Availability Payment for all the relevant Committed Windows.

For the avoidance of doubt, and if not contained in the tables below, a unit must make available the contracted MWs for the required service(s) within the specified Service Window(s), and NESO should not have to send an instruction greater than or less than a unit's contracted capacity due to a limitation of the unit. That is to say:

- The available capacity should be ≥ the contracted SR volume.
- The minimum instructible capacity should be ≤ the contracted SR volume.

For Positive Reserve – BM

Provider Type	Conditions	% of availability payment received	K factor
Generator, Through-zero	MEL – PN ≥ (Contracted Volume)	100	1
Generator, From zero	SEL ≤ (Contracted Volume)	100	1
Through-zero (further)	SIL – PN ≥ (Contracted Volume) or SEL – PN ≤ (Contracted Volume)	100	1
Supplier	SIL – PN ≥ (Contracted Volume)	100	1
Intermittent Generator	PA – PN ≥ (Contracted Volume)	100	1
Generator, Through Zero	MEL – PN < (Contracted Volume)	0	0
Generator, From Zero	SEL > (Contracted Volume)	0	0
Through-zero (further)	SIL – PN < (Contracted Volume) or SEL – PN > (Contracted Volume)	0	0
Supplier	SIL – PN < (Contracted Volume)	0	0
Intermittent Generator	PA – PN < (Contracted Volume)	0	0

For Negative Reserve – BM

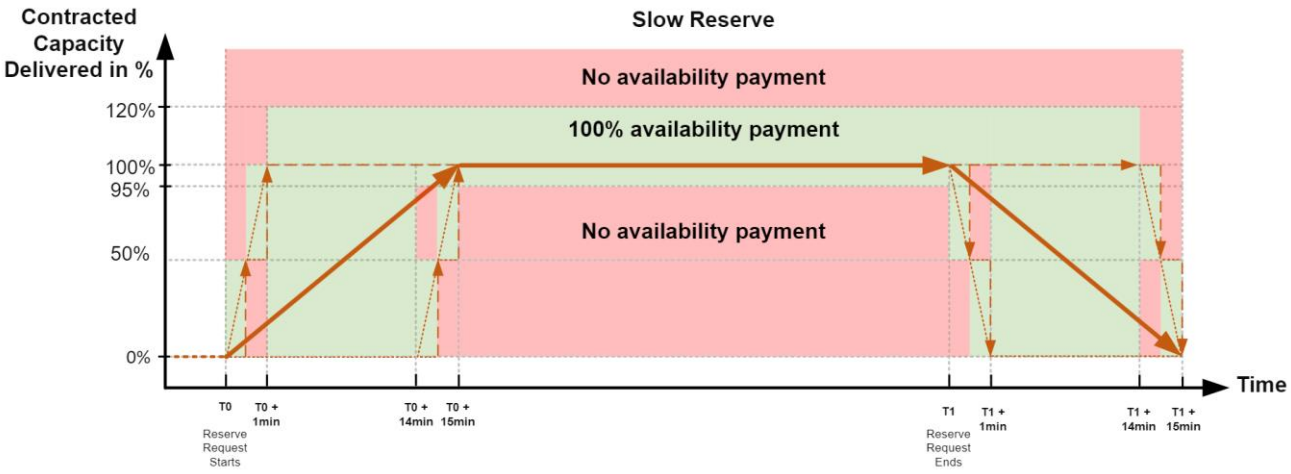
Provider Type	Conditions	% of availability payment received	K factor
Generator, Intermittent Generator	PN – SEL ≥ (Contracted Volume)	100	1
Supplier, Through-zero	PN – MIL ≥ (Contracted Volume)	100	1
Through-zero (further)	PN – SEL ≥ (Contracted Volume) or PN – SIL ≤ (Contracted Volume)	100	1
Generator, Intermittent Generator	PN – SEL< (Contracted Volume)	0	0
Supplier, Through-zero	PN – MIL < (Contracted Volume)	0	0
Through-zero (further)	PN – SEL < (Contracted Volume) or PN – SIL > (Contracted Volume)	0	0

For Positive & Negative Reserve – NBM

Provider Type	Conditions	% of availability payment received	K factor
Generator, Supplier, Intermittent Generator	(Available MWs) ≥ (Contracted Volume)	100	1
Generator, Supplier, Intermittent Generator	(Available MWs) < (Contracted Volume)	0	0

Service Delivery

NESO will conduct performance monitoring of service delivery for all contracted SR Windows. Consequences of non-delivery and unavailability will be set out in full in the Service Terms covering the under-delivery and over-delivery penalties. The figure below presents the overall acceptable delivery envelope for the Slow Reserve service.



Under-delivery

Where a unit has a SR Contract, a minimum of 95% of the instructed MW must be delivered by the relevant unit throughout the instructed period. Failure to deliver will result in the Availability Payment being withheld for the relevant Settlement Period(s).

Utilisation payments for SR Contracts and Optional Services (Non-BM only) will be made for energy delivered.

Over-delivery

Where a unit is contracted for the Firm Service, a maximum of 120% of instructed MWs can be delivered by the unit throughout the instructed period, delivery beyond 120% will result in availability payments being withheld for relevant Settlement Period(s).

Utilisation payments for Firm and Optional Services will be made for energy instructed.

For the avoidance of doubt, availability payments will be made when a unit delivers between 95% and 120% of its instructed MW volume. Where a unit delivers outside of these limits, the Availability Payment will be withheld for the relevant Settlement Period(s).

The ramp rate limit is set to no more than 100% contracted capacity per minute, with no single instantaneous ramp more than 50% of the contracted capacity in any 30-second period. In the service delivery diagram above, this requirement is outlined at T0, T0+14, T1 and T1+14 but, in reality, applies to any viable point within the acceptable ramping envelope defined therein.

NESO will conduct regular performance monitoring of the reserve units' service delivery over a greater period than the individual service day in order to establish overall delivery against the 95%-120% performance measure. There will be no further financial penalties associated with this performance monitoring, but in order to ensure that we do not award Slow Reserve contracts to Reserve units with continued poor performance, we will link the performance monitoring to the Reserve unit's prequalification status. Depending on the root cause, we would expect either a reproving test or possibly revised base parameters (e.g., reduced maximum MW) before we would reconfirm pre-qualification status and access to the daily auction process.

Providers who do not fulfil their day-ahead contract and do not provide the contracted head/foot-room may be responsible for covering costs of alternative actions for replacing the missing volume.

BM providers will be penalised for over/under-delivery when utilised via the usual route of imbalance charges, giving a natural incentive for units to follow expected delivery profiles.

ABSVD methodology will apply to non-BM providers for delivered energy volumes.

State of Energy Management

We are keen to ensure that any learning and industry feedback from other Balancing Services (such as Balancing Reserve), relating to certain behaviours from energy limited assets, are appropriately addressed for the Slow Reserve service.

Regardless of technology type, we expect all SR units to be capable of delivering the full contracted quantity for the duration of each SR Contract and that capability shall not impair any subsequent SR Contract.

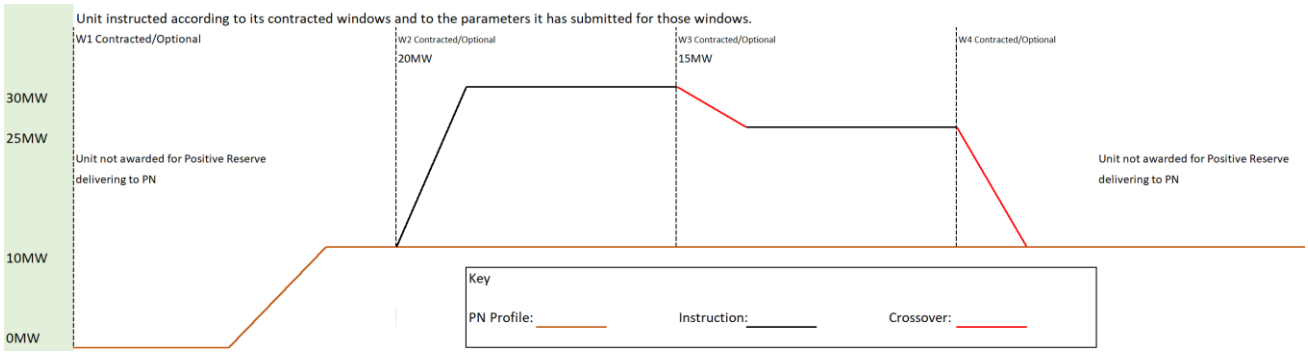
Through our learning from other Balancing Services we have identified instances where some energy limited assets have had insufficient energy to honour their full contracted period and have maintained market positions (such as discharging PNs) and increased their Bid-Offer prices during contracted periods such that their high prices make the units unlikely to be selected as they are economically out of merit, but ensure they continue to receive the capacity Availability Payments.

We believe that withholding the Availability Payment does not provide a sufficient sanction to deter this behaviour. Therefore, for Slow Reserve, we are introducing terms, as seen in the Quick Reserve service, that deal with excessively high or excessively low Bid-Offer prices and provide NESO, at our discretion, with a range of enforceable sanctions.

In line with other Balancing Services, we will have provisions within the Service Terms to penalise units that pursue other commercial use of their assets, and renege on their Balancing Service contract consequently. We intend to introduce a similar method of recovering the cost of alternative action needed to be taken and, at our discretion, will treat instances of unavailability for a SR Contract, due to insufficient state of charge, as commercial unavailability and penalise with the cost of alternative action taken.

Crossovers

The unit must be able to continue delivering the dispatch instruction for the next settlement period following the end of the SR Contract service window. The maximum this could be is in line with the unit's defined Minimum Activation Period.



The above shows how a unit should ramp if contracted or offering optional volume in adjacent windows but with differing MW volumes. That is, any ramping should start at the beginning of the next Settlement Period where there is a change of offered MWs. Providers are expected to submit availability for their crossover delivery, which should be in line with the above requirements.

Providers are expected to submit relevant data for crossover purposes, which include Availability, MNZT and Pricing for any immediately adjacent settlement periods outside of the Quick Reserve service.

Aggregation

Aggregated units can participate in the Slow Reserve auction. The aggregation will be allowed up to GSP group.

6. Procurement Design

SR Contract (Firm Service)

NESO will consider the volume of Slow Reserve that is required for each Settlement Period in a service day (23:00 to 23:00) and this will be procured through the daily auction. Where there is a firm requirement in a Settlement Period, this will be defined by NESO and published on the NESO website. Providers will be able to bid in their SR units to the daily auction for a minimum of 4 (four) contiguous Settlement Periods. Where there is firm requirement SR units are awarded contracts for a minimum of 4 (Four) contiguous Settlement Periods via the daily auction (a Service Window), this will be known as the Firm Service (SR Window) with contracts awarded for each discrete Settlement Period within the SR Window. This commits the SR unit's availability for the full SR Window and the service provider will be paid availability Payments (pay-as-clear) over the duration of each Settlement Period within the SR Window, and a Utilisation Payment (pay-as-bid) if dispatched.

Optional Service

Where NESO do not specify a firm requirement for a Settlement Periods at day-ahead or the service provider has been unsuccessful in the daily auction, SR units will be able to submit utilisation-only bids for the Optional Service within-day for a minimum of 4 (four) contiguous Settlement Periods. If SR units are dispatched under the Optional Service, service providers will receive a Utilisation Payment (pay-as-bid) only.

BM units should continue to offer reserve to NESO via the Balancing Mechanism and will be dispatched via Bid Offer Acceptances (BOAs).

Registration and Prequalification

In line with the implementation of our Dynamic Response and Balancing Reserve products, registration and pre-qualification for the new Slow Reserve services will be completed via NESO's Single Market Platform (SMP).

Maximum Bid Volume

There is no restriction on the maximum size a participating unit can bid up to.

Procurement Requirements

The indicative daily requirement for Positive and Negative Slow Reserve following the recent reserve requirement review is 1700MW. NESO will publish separate Market Information Reports on our website which will set out the volume of each Slow Reserve product we will look to procure (Firm Service) each day.

SR Window

The length of the window refers to the period of time that providers must have their power available for instruction.

Longer windows generally lead to over-holding, as NESO would need to procure the maximum requirement over the full window length. Moreover, longer windows present a challenge for

Distributed Energy Resources (DERs), typically wind and PV plants, because of the inherent variability of the resource, and to energy-limited storage assets like batteries.

Shorter windows, on the other hand, lead to a higher number of transactions and associated costs, as well as the increasing number of window crossover occasions will make it more challenging for operational team to ensure no capacity is lost during these transitions.

To make a trade-off between these two aspects, procuring by settlement period blocks is proposed. These will be chosen to maximise participation, to increase reserve setting flexibility, and also to reduce risks of service transition during periods of higher risk – e.g., Remembrance Day silence, exceptional sporting/national events etc.

In the case of Slow Reserve, this is a minimum commitment of 2 hours, i.e., 4 (four) contiguous 30-minute Settlement Period blocks but can be extended in multiples of 30-minute Settlement Periods beyond this minimum, as defined by the provider, and can start from any appropriate Settlement Period within the operational day.

Daily Auctions

As per NESO's obligations under the Clean Energy Package 6.9, we must aim to procure most or all balancing services no earlier than day-ahead. Daily day-ahead auctions will be running to procure our firm requirement for Positive and Negative Slow Reserve Services.

Co-optimised Auction

We plan to procure Slow Reserve along with Quick Reserve and the frequency response services (DC, DM, DR) in a single, simultaneous, day-ahead, pay-as-clear auction with market welfare being maximised across all services.

Where a unit can provide both frequency response services, Quick Reserve and Slow Reserve services, a provider can make alternative offers to the auction. The clearing algorithm will allocate the unit's capacity to either Frequency Response, Quick Reserve or Slow Reserve to best optimise the market clearing. See Enduring Auction Capability (EAC) Market Design Report for additional information.

Requirements

The daily requirement for Positive and Negative Slow Reserve following the recent Reserve requirement review is 1700MW. NESO will publish separate Market Information Reports on our website which will set out the volume of each Slow Reserve product we will look to procure (Firm Service) each day.

Auction Platform

Slow Reserve auctions will be held daily on our EAC Platform.

Auction Timing

The timing of the auction refers to how long the procurement of the product is made ahead of its delivery. The auction should take place as close to real time as possible to mitigate uncertainty but

leave enough time buffer to allow NESO to activate its Business Contingency Plan (BCP) when auction process fails.

For the enduring solution, it is recommended to run the SR auction in the afternoon, together with the auctions for the Dynamic Response, Balancing Reserve and Quick Reserve products as a single, co-optimised auction. This will facilitate the co-optimisation across all Reserve and Response products in the future. This decision follows industry feedback from separate BR and QR Phase 1 consultations.

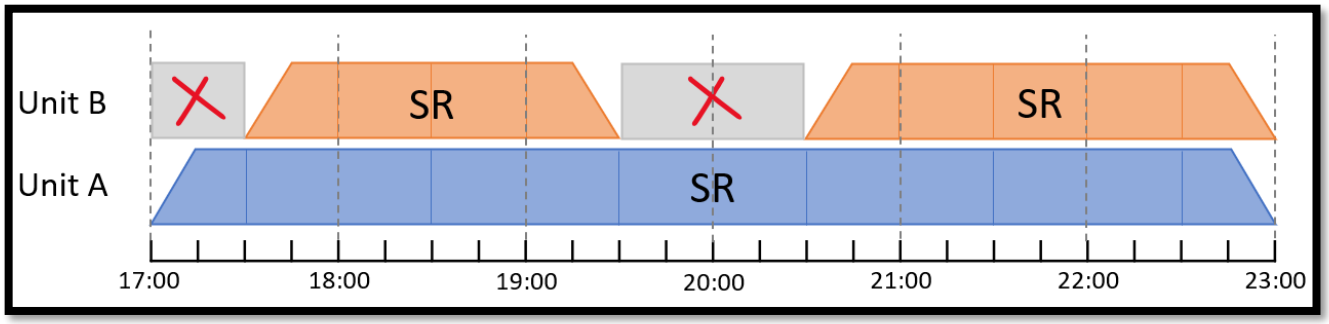
Bid Submission

A Registered Service Provider can only participate in the daily auctions once they have completed pre-qualification. NESO will grant access to the Auction Platform and provide log-in details for the Registered Provider or their nominated Agent.

The Registered Service Provider will then be able to offer NESO its Unit(s) for the Positive/ Negative Slow Reserve Firm Service on the EAC Auction Platform by submitting sell orders. For each product, a sell order will include the required bid parameters, such as the availability price (£/MW/h), the volume (MW), confirmation if the bid is curtailable (the minimum capacity they are willing to accept) and any other additional parameter(s) as may be specified in the relevant Auction Rules.

Bid validation, such as checking minimum (MW) not exceeding the pre-qualified asset MW, will be done at bid submission stage.

Each Unit can bid for a minimum of 4 (four) or more consecutive Settlement Periods within an Operational Day, starting from any applicable 30-minute Settlement Period, as illustrated below. Here, the example shows 2 units contracted for Slow Reserve. Unit A is contracted from 17:00-23:00 in a single continuous window, whilst Unit B is contracted for 2 separate SR Windows (17:30-19:30 and 20:30-23:00), with a period of unavailability between.



Providers must submit bids for consistent volumes per Service Window. So, in the example above, Unit A would have submitted a consistent bid across all Settlement Periods within the single Service Window from 17:00-23:00. Unit B, on the other hand, could submit different MWs across its two Service Windows. For example, for the first Service Window, 17:30-19:30, Unit B could be contracted for *n* MWs, and for the second Service Window, 20:30-23:00, contracted for *m* MWs.

NESO submits the daily buy-order to the EAC platform which specifies a maximum volume (MW) that NESO is willing to procure at different price levels (£/MW/h) for each product and SR Window.

The auction platform will provide a rolling window function which means the auction gate will be open in advance such that orders can be submitted 14 days before each auction (timing to be confirmed).

Sell-Orders can be submitted, reviewed, modified, or deleted before auction gate closing.

Assessment Principles

To secure the system economically, the clearing algorithm will aim to first maximise the Total Welfare, then minimise the overall procurement cost (when there is a choice of clearing prices), as set out in the EAC Market Design Report.

A buy curve (generated for each Settlement Period) will be applied to reflect that the volume NESO is willing to procure varies with price. The cost of taking alternative actions, offered by units of similar capability and services, will be taken into consideration when generating the buy curve.

All bids will be ranked in price ascending order against the buy curve to identify the marginal bid.

Auction Results

Auction results can be accessed after each auction via the enduring auction platform by 14:30 and NESO Data Portal by 14:45.

Linked Sell-Orders

Provider Bids (sell-orders) that are linked can only be accepted or rejected all together. There are two types of linking: link by time (i.e., SR Windows) and link by products.

Linking by SR Windows means participants can link their bids across more than one SR Window. Due to commercial reasons, for example SOC management, some participants may want to do this (i.e., submitting multiple-period orders) to avoid that their units are accepted for some non-adjacent windows. Or some providers who have high start-up costs may want to span this cost over longer delivery periods to make themselves more attractive in the market.

Linking by products means participants can link their bids across products (i.e., Positive and Negative Slow Reserve). Without this function, providers who prefer getting awarded in dual directions will offer each service at a higher price to make sure they would be happy if only one product is cleared. Additionally, this will not breach Clean Energy Package Article 6.9 requirements, as NESO are running two separate markets: providers can submit different volume and price in each market; these two markets cleared separately with different volume and price; and two contracts are produced.

Linking functions will be supported by Enduring Auction Capability. There is no strong reason for us to put additional restrictions (and therefore additional costs) on bid submission/validation to stop participants submitting linked bids. Full flexibility will be given to all participants. We are expecting this will facilitate market participation and increase market efficiency.

Thus, linking bids (by SR Window or product) will be permitted for Slow Reserve.

Linked Service Windows

Crossovers occur at Settlement Period boundaries and require significant consideration during real-time operations. They are routinely managed to maintain the frequency across Settlement Period boundaries, as otherwise we could see significant changes in output leading to a low or high frequency event, if large enough.

A key risk period for the SR service is during peak periods of demand where there are fewer alternatives available in the market. If we are using our pre-fault reserves to manage normal uncertainty, it could mean NESO have no other options available to help manage a crossover period in a fault situation. As a solution to effectively manage these high-risk periods, NESO are introducing Linked Service Windows. Such Linked Service Windows, issued by NESO, state that the submission and/or acceptance of a sell-order is conditional on the submission and/or acceptance of sell-orders of identical MW volume for each Settlement Period described in the Linked Service Window section during a contracted SR Window. This ensures there are consistent units contracted across key crossover periods, allowing for their effective management of the risk posed. Such Linked Service Windows will be communicated appropriately with market participants ahead of the auction opening.

Slow Reserve is planned to go live with this functionality enabled. NESO will assess the requirement for Linked Service Windows over time and may introduce this capability if we see a system security need whilst ensuring we give plenty of notice to industry.

Bid Curtailment Rules

The Slow Reserve requirement could change throughout the day. Given the design choice to allow participants to link their bids together across time it was important that there was still flexibility within the bidding structure to fit the supplied volume of SR to the NESO requirement which may change across the day and between Settlement Periods. NESO would allow SR providers to user-define the curtailibility of the bid (i.e., the minimum capacity they are willing to accept).

Revenue Stacking

Stacking is the ability to use the same unit to provide different products simultaneously (i.e., in the same window), effectively allowing for multiple revenues from different markets with a single unit.

For clarity we are using the following definitions for Stacking;

Co-delivery

Definition: Being paid multiple revenues from the same asset, using the same capacity, in the same time period (in the same direction).

SR providers can Co-deliver their capacity with the Capacity Market (CM). Where a CM Notice (CMN) is issued, these providers should continue to make headroom available as per any active Slow Reserve commitments. To ensure providers are protected from penalties for breach of their CM agreement, should a System Stress Event occur following a CMN, SR has been added to the list of Relevant Balancing Services.

In some cases, it may also be appropriate for providers to Co-deliver SR with the BM.

Splitting

Definition: Being paid multiple revenues from the same asset, but with different capacity, in the same time period.

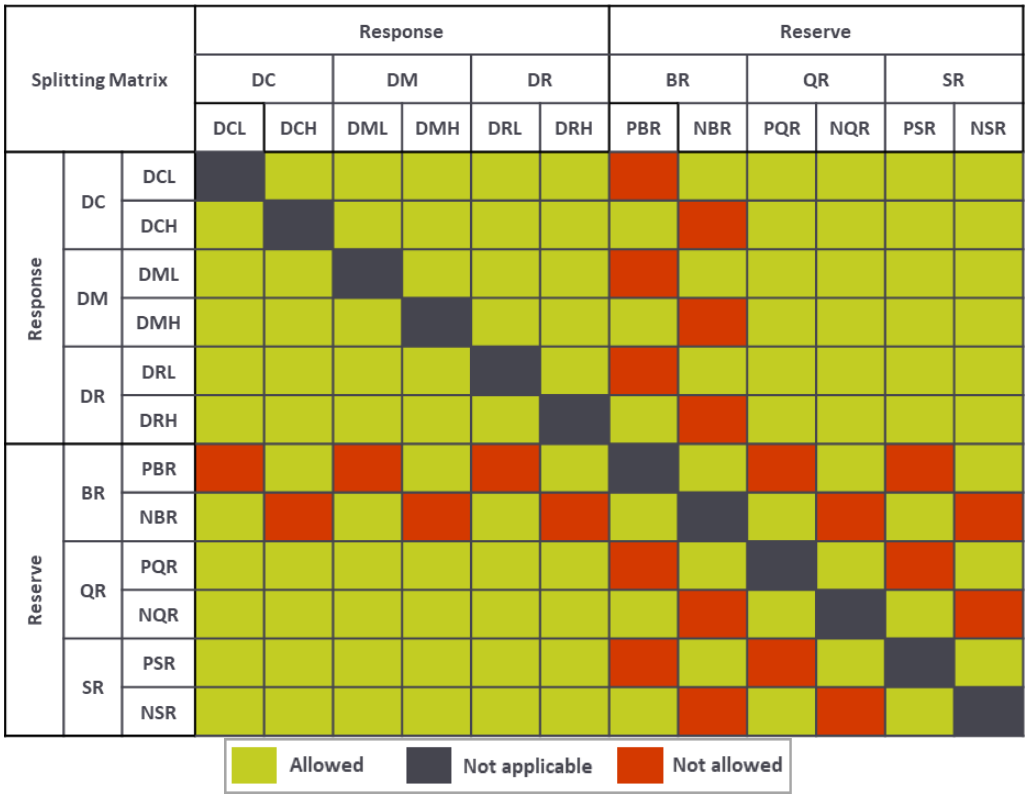
For a given SR Window, splitting is allowed between Positive and Negative SR as long as different capacity from the asset is used for each service. Splitting is also allowed with the BM as well as Voltage and Stability services. However, Splitting is not allowed between the same polarity Reserve products, i.e., PSR & PBR. Availability payments will be withheld for any units holding >1 Reserve service in the same direction for a given Settlement Period.

It is not the intention to prevent providers from co-delivering Reserve with non-active power services, such as SpinPump or SpinGen, as this would significantly reduce the availability of other assets. However, if a unit is required to be in SpinGen etc. in order to be able to deliver the service, they should not be paid for that service.

It is worth noting that the standard stacking or BM participation rules apply and need to be followed. That is, if a unit is stacking/splitting multiple services, then the data submitted to NESO must be that of the most granular service.

We have yet to finalise how the Slow Reserve Service will interact with other Balancing Services or agree on an implementation date for the necessary IT capability. We do however, have a proposal for how we see the Slow Reserve service being split with other balancing services that we would look to implement at the earliest opportunity. This may not be ready in time for the initial launch of Slow Reserve, but we would welcome feedback from market participants on the following splitting proposal.

Proposed Splitting Matrix:



Locationality

Throughout the development of this product design, the merits and costs of introducing some locational valuation to the assessment process for the product were considered.

Locational assessment would allow NESO to avoid contracting for reserve on units located behind an anticipated network constraint. This is not an approach that has been taken in any Balancing Services market to date.

This functionality should span across all NESO's ancillary services and therefore requires a consolidated effort across multiple internal teams and is outside the scope of Quick Reserve and Slow Reserve project work.

Work has begun on Locational Procurement but there are no current timelines which can be shared with industry. Any future Locational Procurement capability will be subject to future NESO assessment and industry consultation.

Active Network Management Schemes

Providers will need to confirm if their eligible assets have a condition in their DNO connection agreement whereby they are signed up to an Active Network management (ANM) Scheme / Flexibility Connection.

NESO has the right to not prequalify units where some/all of the assets are on ANM connections. However, we will consider this on a case-by-case basis and may (at our sole discretion) 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).

NESO shall continue to keep this under review and any changes to this position shall be consulted on accordingly.

Availability Declarations

Once a contract has been awarded for the Firm Service, or the Service Provider wishes to declare themselves available for the Optional Service, they will be required to submit an availability declaration for the relevant unit.

For non-BM providers these (re)declarations will be submitted into the appropriate OBP route as soon as reasonably practicable after contract award but in any event must be submitted no later than sixty (60) minutes prior to each Slow Reserve Service Window.

Availability declarations must be submitted in accordance with the Service Terms and include;

- Confirmation of MW available,
- A utilisation price (£/MWh)

For BM Service Providers, declarations must be made by way of Grid Code BM Unit Data submissions via EDL/EDT (or wider access equivalent) as soon as reasonably practical after contract award but in any event must be by no later than Gate Closure.

Declarations can be submitted ahead of time (either before, during or after auction/contract award) provided that the MW value in a Service Provider's contract (Firm Service) and availability

declaration match. Where no (re)declaration has been submitted by the deadline, or the declared available MW value does not match the contracted MW, the unit will be assumed to be unavailable.

Unavailability for commercial or non-technical reasons is not permitted for the Firm Service.

Settlement and Pricing

There are two forms of payment that NESO will make for the Slow Reserve services.

1. **Availability Payments**

Where a Service Provider (BM and non-BM) secures a contract for the Firm Service, NESO will make an Availability Payment subject to the relevant market clearing price (£/MW/h) for the Service Window covered by the Firm Service contract. Payments for availability are subject to performance monitoring.

2. **Utilisation Payments**

For each Slow Reserve instruction, non-BM providers will receive a payment for the energy instructed on a £/MWh basis if instructed to deliver the Firm service in a Service Window. Additionally, where NESO instructs an Optional Service from a Non-BM Unit which is declared available for the Service Window, then it will pay for the energy instructed on a £/MWh basis.

All Utilisation Payments will be calculated using the Utilisation Price on a pay-as-bid basis submitted by the Service Provider for the relevant Service Window. Utilisation payments will include the energy delivered in ramping towards and ramping from the instructed MW level.

For BM providers, energy delivered will be settled by Elexon as part of the Balancing Mechanism. Non-BM providers will be settled by NESO.

Availability payments and utilisation payments will be settled by NESO monthly, subject to deductions for service delivery failures following performance monitoring.

ABSVD

ABSVD will be applied in accordance with the published ABSVD Methodology for non-BM units. BM units will have their market position adjusted by the BSC approach used for BOAs in a similar way. To apply the methodology, non-BM units will need to submit the MSID pairs to allow the ABSVD to be assigned to the Balancing Responsible Party.

Transfer of Slow Reserve Contracts

The SR Service Terms will allow a Service Provider (Primary Service Provider) to transfer their SR contract to another unit prequalified for SR (either their own or another Service Provider (Secondary Service Provider)). This is in line with other Balancing Service contracts, however we are making some changes for SR that allow for all applicable payments to be made direct to the Secondary Service Provider, where previously NESO made such payments direct to the Primary Service Provider. When the Primary Service Provider assigns a Slow Reserve Contract to the Secondary Service Provider this effectively now means that a transfer is a full assignment, transferring all rights and obligations under the Service Terms for the Contracted Window.

Appendix 1 - Dynamic Parameters as per Balancing Code BC1

Please refer to the Balancing Code BC1 for full details.

The Dynamic Parameters comprise:

- Up to three Run-Up Rate(s) and up to three Run-Down Rate(s), expressed in MW/minute and associated Run-Up Elbow(s) and Run-Down Elbow(s), expressed in MW for output and the same for input. It should be noted that Run-Up Rate(s) are applicable to a MW figure becoming more positive;
- Notice to Deviate from Zero (NDZ) output or input, being the notification time required for a BM Unit to start importing or exporting energy, from a zero Physical Notification level as a result of a Bid-Offer Acceptance, expressed in minutes;
- Notice to Deliver Offers (NTO) and Notice to Deliver Bids (NTB), expressed in minutes, indicating the notification time required for a BM Unit to start delivering Offers and Bids respectively from the time that the Bid-Offer Acceptance is issued. In the case of a BM Unit comprising a Genset, NTO and NTB will be set to a maximum period of two minutes;
- Minimum Zero Time (MZT), being either the minimum time that a BM Unit which has been exporting must operate at zero or be importing, before returning to exporting or the minimum time that a BM Unit which has been importing must operate at zero or be exporting before returning to importing, as a result of a Bid-Offer Acceptance, expressed in minutes;
- Minimum Non-Zero Time (MNZT), expressed in minutes, being the minimum time that a BM Unit can operate at a non-zero level as a result of a Bid-Offer Acceptance;
- Stable Export Limit (SEL) expressed in MW at the Grid Entry Point or Grid Supply Point, as appropriate, being the minimum value at which the BM Unit can, under stable conditions, export to the National Electricity Transmission System;
- Stable Import Limit (SIL) expressed in MW at the Grid Entry Point or Grid Supply Point, as appropriate, being the minimum value at which the BM Unit can, under stable conditions, import from the National Electricity Transmission System;
- Maximum Export Limit (MEL) expressed in a series of MW figures and associated times, making up a profile of the maximum level at which the BM Unit may be exporting (in MW) to the National Electricity Transmission System at the Grid Entry Point or Grid Supply Point or GSP Group, as appropriate.
- Maximum Import Limit (MIL) expressed in a series of MW figures and associated times, making up a profile of the maximum level at which the BM Unit may be importing (in MW) from the National Electricity Transmission System at the Grid Entry Point or Grid Supply Point or GSP Group, as appropriate.

Appendix 2 – Acronym Definitions

ABSVD	Applicable Balancing Services Volume Data
BMU	Balancing Mechanism Unit
BOA	Bid-Offer Acceptance
CM	Capacity Market
CMN	Capacity Market Notice
DER	Distributed Energy Resources
DNO	Distribution Network Operator
EAC	Enduring Auction Capability
EBR	Electricity Balancing Regulation
EDL / EDT	Electronic Dispatch Logger / Electronic Data Transfer
ENCC	Electricity National Control Centre
GSP	Grid Supply Point
NBM	Non-Balancing Mechanism
PN	Physical Notification
QR / NQR / PQR	Quick Reserve / Negative Quick Reserve / Positive Quick Reserve
SOC	State of Charge
SR / NSR / PSR	Slow Reserve / Negative Slow Reserve / Positive Slow Reserve
STOR	Short Term Operating Reserve