

Dynamic Regulation Participation Guidance Document

Introduction

This guidance document should be read in conjunction with the following documentation which is available on the NGESO website:

- Dynamic Regulation Service Terms
- Dynamic Regulation Service Glossary
- Dynamic Regulation Auction Rules
- Dynamic Regulation Testing Documents
 - DR Testing Guidelines
 - DR Testing Analysis Tool – user guide
 - DR Testing Analysis Tool
- Balancing Services General Terms and Rules of Interpretation

Version	Effective Date	Change	Page
1.0		Version 1	

Version 1.0

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1. Service overview

The key elements of the DR service are:

- Designed to help contain frequency within operational limits +/- 0.2Hz from target frequency of 50 Hz
- Automatic activation, from either generation or demand, or energy limited (e.g. battery) assets
- Min 1MW and max 50MW of response capacity per Response Unit (or such other min/max as NGESO may notify from time to time)
- DR Sell Orders may only be submitted in whole MWs
- Contract delivery across 4 hour EFA Blocks
- Capability to disarm and re-arm in response to an instruction from NGESO
- Availability payment only
- Procured separately for low and high frequency DR (DR-L and DR-H)
- Participation by both BM and Non-BM Participating assets
- Energy limited assets to comply with “state of energy” management rules
- Aggregation possible where assets behind same GSP Group (subject to technical assurance being carried out on the risks associated with moving to GSP Group)
- Service providers to have the necessary data transfer capabilities to provide both operational and performance data.

Transitional arrangements are in place for soft launch, which are outlined in section 16 of this document.

2. Service delivery

Acknowledging the complexity of describing this service via formulae and definitions we have provided a ‘plain English’ description of Dynamic Regulation below.

The requirements below describe the essential features of the DR service. They are integrated into the service description and payment formulae in the schedules to the DR Service Terms, and also feature in the requirements set out in the DR Testing Documents.

A Response Unit should respond continuously and proportionally to frequency as it deviates from the target (50Hz). At each point of system frequency between 49.8Hz and 50.2Hz there is a target quantity of power delivery for a providing Response Unit (expressed as a percentage of its contracted quantity MW):-

- 100% at +/- 0.2Hz
- 0% at +/- 0.015Hz
- 0% at 50Hz
- Linear progression between all points above

NGESO expects full contracted quantity to be delivered no later than 10 seconds after a step-change in frequency from 50Hz to 49.8Hz, or in the case of DR-H from 50Hz to 50.2Hz. However, in all but the most extreme events frequency does not move in step-changes like this. It could be said (when measuring at each 50ms) that frequency moves in a continuous series of small step-changes. i.e. from 50.00Hz, 49.99Hz, 49.98Hz etc.

As frequency is continually moving/deviating, NGESO must see some change in response power delivery up to and including 2 seconds after the deviation occurring.

3. Registration and pre-qualification

For a participant to register as a potential provider of DR, it must first have its corporate details entered on NGESO's systems to become a Registered Service Provider, and then register for the Dynamic Regulation service as a Registered DR Participant which involves acceding to the DR contract documentation.

Once registration is complete, a Registered DR Participant may then submit assets under its operation or control for prequalification by NGESO as Eligible Assets. Once pre-qualified (which may involve asset testing and validation), Eligible Assets may be allocated by the Registered DR Participant to Response Units, which may then participate in the DR daily auctions.



This section outlines the registration process and associated timings for registration and asset pre-qualification. Whilst it is important that participants allow sufficient time to register and prepare for participation, NGESO will endeavor to allow participants some flexibility on timescales in relation to the soft launch period of delivery where practicable.

- Step 1 – participant requests registration as a Registered Service Provider (and associated user IDs)
- Step 2 – NGESO validates registration and issues user IDs (*entity is now a Registered Service Provider*)
- Step 3 – participant accedes to relevant contract documentation to facilitate Dynamic Regulation participation
- Step 4 – participant submits one or more assets for pre-qualification as an Eligible Unit
- Step 5 – NGESO undertakes any necessary asset testing and validation
- Step 6 – NGESO confirms completion of prequalification process (*assets are now Eligible Assets capable of being allocated to a Response Unit*)
- Step 7 – participant allocates Eligible Assets to Response Units (*participant can now enter Response Units into DR daily auctions*)

Except where the contingency procedure applies, all of the above steps (which are summarised below) are to be completed via NGESO's single market platform, and the participant must ensure that all information submitted on the single market platform is fully complete and correct.

In the event that the single market platform is unable to be utilised to complete any or all of the above steps, NGESO may (at its discretion) implement a contingency procedure and notify this to participants in writing providing as much advance notice as is reasonably practicable in the circumstances. The contingency procedure may include completion of Steps 1, 2 and 3 using Forms A, B and C, copies of which have been provided alongside this document, and Steps 4, 5, 6 and 7 by email submission of the 'DR Provider Data Template', which again is provided alongside this document. The notification from NGESO informing participants that the contingency procedure has been implemented shall confirm the manner and timescales in which such documentation is to be submitted to NGESO.

Registration as Registered Service Provider

Each participant is required to submit its corporate details, together with details of any related entity on whose behalf it is acting as agent.

Prequalification of Eligible Assets

For asset prequalification, NGESO will require submission of all relevant technical details associated with the asset to enable NGESO to complete any necessary asset testing and validation. The Registered Service Provider must also submit a testing approval report for each asset, which must be completed by an Independent Technical Expert (ITE), as described in the Testing section which follows.

Allocation to Response Units

NGESO also requires Registered Service Providers to allocate Eligible Assets to Response Units, and to identify the technical parameters associated with each Response Unit.

Please note, every Response Unit registered onto NGESO's system must have at least one Eligible Asset allocated to it to be capable of participating in the daily DR auctions.

A Response Unit can only have allocated to it multiple Eligible Assets if they are all located within the same group Grid Supply Point, although NGESO may (at its discretion) determine that, for system operational reasons, this restriction may need to be increased to require multiple Eligible Assets allocated to a Response Unit to be located within the same Grid Supply Point.

Initial registrations must be completed in line with the timings outlined below:

Activity	Provider	NGESO
Pre-qualification of Eligible Assets	In order to enable allocation activity, valid and complete data should be submitted 13 calendar days in advance.	Allocation activity can take place 13 calendar days after submission of validly completed data. NGESO will notify the Registered

		Service Provider if allocation activity can be accommodated sooner.
Allocation of Eligible Assets to Response Units	Allocation can only occur on a weekly basis and must be sent to NGENSO in the “market window” on a Monday (see further below)	Deemed accepted upon submission, subject to errors and/or incomplete data New/updated Response Units can participate in DR daily auctions from and including that for DR Service Days commencing 23.00 hours the following Thursday

If Registered Service Providers wish to change the pre-qualification status and/or allocation to a Response Unit of Eligible Assets, including introducing new Eligible Asset(s) for pre-qualification or increasing the response capacity of an existing pre-qualified Eligible Asset, this must be done as described above (on the single market platform or using any contingency arrangements where applicable). Any increase in capacity of an existing Eligible Asset must be accompanied by a testing approval report in the same manner as for new Eligible Assets.

NGESO reserves the right to inform Registered Service Providers in writing (via email) that an Eligible Asset has been de-registered (i.e. pre-qualification status revoked) in accordance with the DR Auction Rules.

Please note that allocation of Eligible Assets to Response Units, whether submitted via the single market platform or using the DR Provider Data Template (where the contingency arrangements apply) are only processed by NGENSO on a weekly basis, and can only therefore be submitted in the stipulated daily “market window” ending on Monday each week. The market window is the period from 15:00 hours on a calendar day to 10:00 hours on the next calendar day (and where this document refers to a market window for a particular calendar day, unless otherwise indicated that is a reference to the market window which ends on that day). Any submissions from Registered DR Participants received outside this market window will be rejected, and so will not be applicable, and must be resubmitted in the next following Monday market window.

For the avoidance of doubt, allocation submissions are not required to be made every week. Once validly submitted, a subsequent submission is only required should any information change. As explained above, any updates submitted during the Monday market window will not become effective until the DR Service Day commencing 23:00 hours on the following Thursday.

All queries and communications shall be made via a providers account manager or commercial.operation@nationalgrideso.com

4. Daily Auctions

This section outlines the process for submitting DR Sell Orders in the daily auctions, and associated timescales.

Designated Auction Platform

A Registered Service Provider can only participate in the DR auction process once it is confirmed as a Registered DR Participant for DR on the single market platform (or through receipt of Form C where NGENSO has implemented contingency arrangements), and only in respect of assets under its operation or control which have been validated by NGENSO as Eligible Assets and allocated by the Registered DR Participant to Response Units.

The DR auction process is hosted by EPEX, and participation is more particularly described in the Trader User Guide at the EPEX user guide (as updated from time to time and available on the NGENSO website).

DR Buy Orders

NGESO will confirm to EPEX its DR requirement (MW) for each product type by no later than 14.30 hours on D-1, for each EFA Block in the following EFA Day. Each EFA Day for which NGENSO has indicated a requirement in one or more EFA Blocks is a “DR Service Day”.

DR Sell Orders

Each DR Sell Order is required to cover a single EFA Block in any DR Service Day and must be submitted during the 13 day period between the Auction Opening and Auction Closing Times.

Each DR Sell Order must relate to a single Response Unit, DR product type (DR-L or DR-H) and EFA Block, and must indicate a single availability price (£/MW/h) and offered contracted quantity (not exceeding the registered quantity of the aggregate registered quantity of each of the component Eligible Assets).

Multiple DR Sell Orders may be submitted for the same Response Unit, the same EFA block and the same DR product if Parent-Child blocks are used. All DR Sell Orders shall reflect and be consistent with the Eligible Asset and Response Unit registration details.

After the Auction Closing Time, the auction algorithm will match all valid DR Sell Orders to the DR Buy Order for the relevant EFA Block and product type, through the acceptance (or partial acceptance) of DR Sell Orders in accordance with the DR Auction Rules. This will produce a Market Clearing Price for that EFA Block and product type. NGESO may publish further guidance from time to time on the operation of the DR auction process.

The auction timescales are as follows:

- Daily auction open on a rolling 13-day basis at 08:00 on D-14
- Ability to withdraw and re-submit DR Sell Orders up to daily auction close
- Daily auction close is at 14.30 on D-1
- The result of each auction will be communicated or otherwise published by EPEX each day no later than 15.00 on D-1 and will confirm the (Pay as Cleared) Availability Price.

The DR Response Contract for the relevant Response Unit will be formed at the time of communication or publication by NGESO of the auction outcome.

- NGESO will aim to publish all auction results in full (via its Daily Auction Report) on our website/data portal each working day at approximately 16.30 on D-1

This is illustrated below:

D-14	D-1	D-1	D
08.00 Order book opens for DR Sell Orders	14.30 Auction Closing Time (Order book closes) Deadline for submission/update of NGESO's Buy Order	15.00 Auction results published by EPEX	23.00 Delivery starts for EFA block one on service delivery day D (which is the same calendar day as D-1)
NOTE: Processing of allocations and re-allocations of Eligible Assets to Response Units during Monday market window (ie 15:00 hours Sunday to 10:00 hours Monday) will be effective (so as to enable participation in the Auctions by the relevant Response Unit) from service delivery day beginning 23:00 Thursday			

5. Testing

All assets seeking to participate in DR as Eligible Assets will be required to pass testing prior to pre-qualification. Aligned with our other frequency products, testing will be the responsibility of the Registered DR Participant and subject as provided below should be undertaken/verified an Independent Technical Expert (ITE). Registered DR Participant should refer to the accompanying document DR Testing Documents, DR Testing Analysis Tool User Guide & DR Testing Analysis Tool for all relevant testing information. Testing is required at both 10Hz and 2Hz.

NGESO will require an ITE approval report as part of any submission of an Eligible Asset for pre-qualification. The report shall be deemed accepted by NGESO once submitted. However, should any queries be raised the Eligible



Asset shall not be capable of being allocated to a Response Unit or participation in the DR daily auctions until any queries have been satisfied.

Testing shall also be required before the registered response capacity of an existing Eligible Asset can be increased.

6. Settlement

For each EFA Block the subject of a DR Response Contract, the applicable DR product will be settled against the market clearing price (£/MW/h) for that EFA Block and DR product established pursuant to the DR Auction Rules. For further information regarding how Availability Payments are calculated, and payment terms, please refer to the DR Service Terms.

NGESO shall apply DR energy volumes within Applicable Balancing Services Volume Data (ABSVD) for BM units only. It is the responsibility of each Registered Service Provider to ensure that the relevant BM Unit Lead Party has made the appropriate election.

In addition, where it has not already done so, each Registered Service Provider must ensure that it has completed the necessary vendor setup forms that are outlined on our Settlement webpage to be set up as a vendor on NGESO's systems. These should be submitted as soon as possible so that we make payments in a timely manner in accordance with the DR Service Terms.

7. Performance Monitoring

NGESO will conduct regular performance monitoring of the DR service. Please refer to the DR Service Terms regarding consequences of non-delivery and unavailability, which may impact on the level of availability payments. NGESO will be seeking to increase performance transparency to industry for the DR service and publish summary reports on the quality of service delivery.

8. Operational and Performance Baselines

An important component of DR service delivery is submission of baselines, required from all Registered DR Participants.

Operational

Response Units that are also registered in the Balancing Mechanism ('BM') are required to submit an operational baseline in the form of a Physical Notification (PN) (the processes and timings associated with PN submissions can be found in the Grid Code at Balancing Code No.1 (BC1) Pre gate Closure Process in particular BC1.4 and BC1.A.1.1).

Response Units that are not registered in the BM ('non-BM') will only be required to submit an operational baseline that conforms with the rules referenced above as and when NGESO implements a communications channel that can receive these submissions.

Performance

In respect of both BM and Non-BM Response Units, Registered DR Participants with DR Response Contracts are required to submit Performance Baselines for their assets through the Data Concentrator API. These baselines can be submitted up to 4 decimal places. The timescales and other requirements for these baselines are set out in the DR Service Terms.

Operational vs Performance baselines

As the name suggests the Performance baseline will be used by NGESO to measure the performance of a Response Unit when delivering Dynamic Regulation. The difference between the active power output/demand and the performance baseline is the quantity of response delivered.

The Operational baseline is a type of nomination baseline, which must be submitted in advance and covering the period up to 90 minutes in the future. The Response Unit is committed to follow its Operational baseline giving NGESO the benefit of visibility of planned output (a feature upon which the Balancing Mechanism and NGESO balancing strategy relies). In addition, the Operational baseline serves to protect NGESO against provider 'gaming' of the service.

Physical Notifications (PNs) as used in the Balancing Mechanism are acceptable Operational baselines. A PN does not need to be at a static value for the duration of a settlement period, it can change on a minute-by-minute basis.

NGESO will be checking that the Operational and Performance baselines are equivalent. Ideally there would only be one

form of baseline but system limitations mean that Operational baselines submitted via BM systems cannot accommodate the required level of detail for this high specification service, thus Performance baselines have been introduced to allow Response Units to submit up to 4 decimal places with a value at 500 millisecond intervals.

9. Energy Requirement and Duration

Energy limited as an asset type is defined in the DR Service Glossary as:

a classification given for the purposes of **Dynamic Regulation** to any **Response Unit** comprised of one or more **Eligible Assets**:-

- (a) which creates its store of energy by using power ultimately drawn from the **National Electricity Transmission System**; and/or
- (b) whose **State of Energy** at the start of a relevant **EFA Block** is insufficient to provide full delivery of the **Contracted Quantity** for the duration of that **EFA Block**;

These assets are subject to a number of additional rules detailed in section 6 of the DR Service Terms. One area of additional rules relates to; delivery duration, response energy and energy recovery.

The rules are required to give NGESO assurance that energy limited assets can reliably provide the full contracted quantity of Dynamic Regulation. The duration and volume requirements have been sized based on analysis of frequency events and a risk-based assessment.

The terms below are fully defined in the DR Service Glossary. Below a plain English explanation is offered.

1. Contracted Quantity
 - a. the amount of Response (MW) which a Service Provider has agreed to provide.
2. Delivery Duration
 - a. sixty (60) minutes
3. Response Energy Volume
 - a. the amount of stored energy (or capability to store energy) that a Response Unit should be capable of delivering before becoming unavailable due to exhaustion. Calculated as the Contracted Quantity multiplied by the Delivery Duration.
4. Energy Recovery
 - a. the minimum volume of stored energy (or capability to store energy) capable of being recovered by way of State of Energy management in a single Settlement Period. Calculated as twenty percent (20%) of Response Energy Volume.

Example:

Consider a battery asset with capabilities of 100MW and 100MWh.

This asset may choose to offer a DR-L contract of 50MW in a single 4 hour EFA block. The parameters above would be computed as:

1. Contracted Quantity
 - a. 50MW of DR-LF
2. Delivery Duration
 - a. 60 minutes
3. Response Energy Volume
 - a. 25MWh
4. Energy Recovery
 - a. 5MWh

10. State of Energy (SoE) Management

NGESO requires that delivery of DR is continuous over the EFA Block. The state of energy rules and the baseline rules have been designed to underpin this requirement.

DR does not permit the management of SoE via delivery deviation within an 'envelope'. This 'charging in the dead band'



has been shown to be damaging to frequency quality, and whilst manageable with limited volumes of Enhanced Frequency Response, is not possible for the larger volumes of DR and subsequent response products.

The solution to SoE management for DR is to require energy limited units to:

1. Begin the EFA Block with a level of stored energy adequate for its contracted response quantity.
2. Review the level of stored energy at the start of each settlement period during that EFA Block, looking at the net energy delivery in the previous settlement period.
3. Aim to return the stored energy level to an appropriate level by the submission (and following) of operational baselines. This means charging or discharging by following a baseline.

Example:

Contracted quantity: 50MW of DR-L (i.e. low frequency response only)

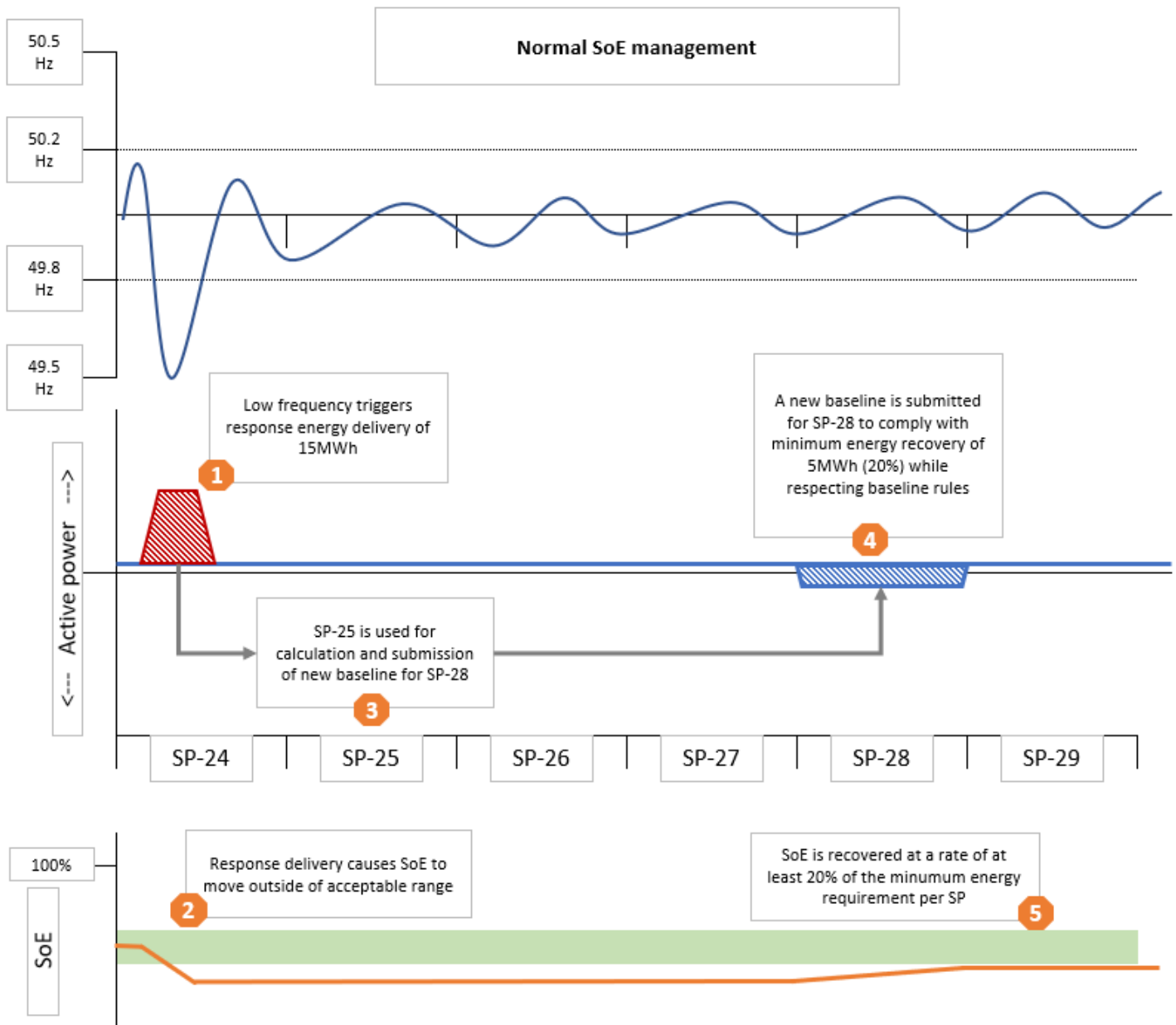
Minimum energy requirement: 25MWh - calculated as 30 minutes at full power: $(30/60) \times 50 = 25\text{MWh}$

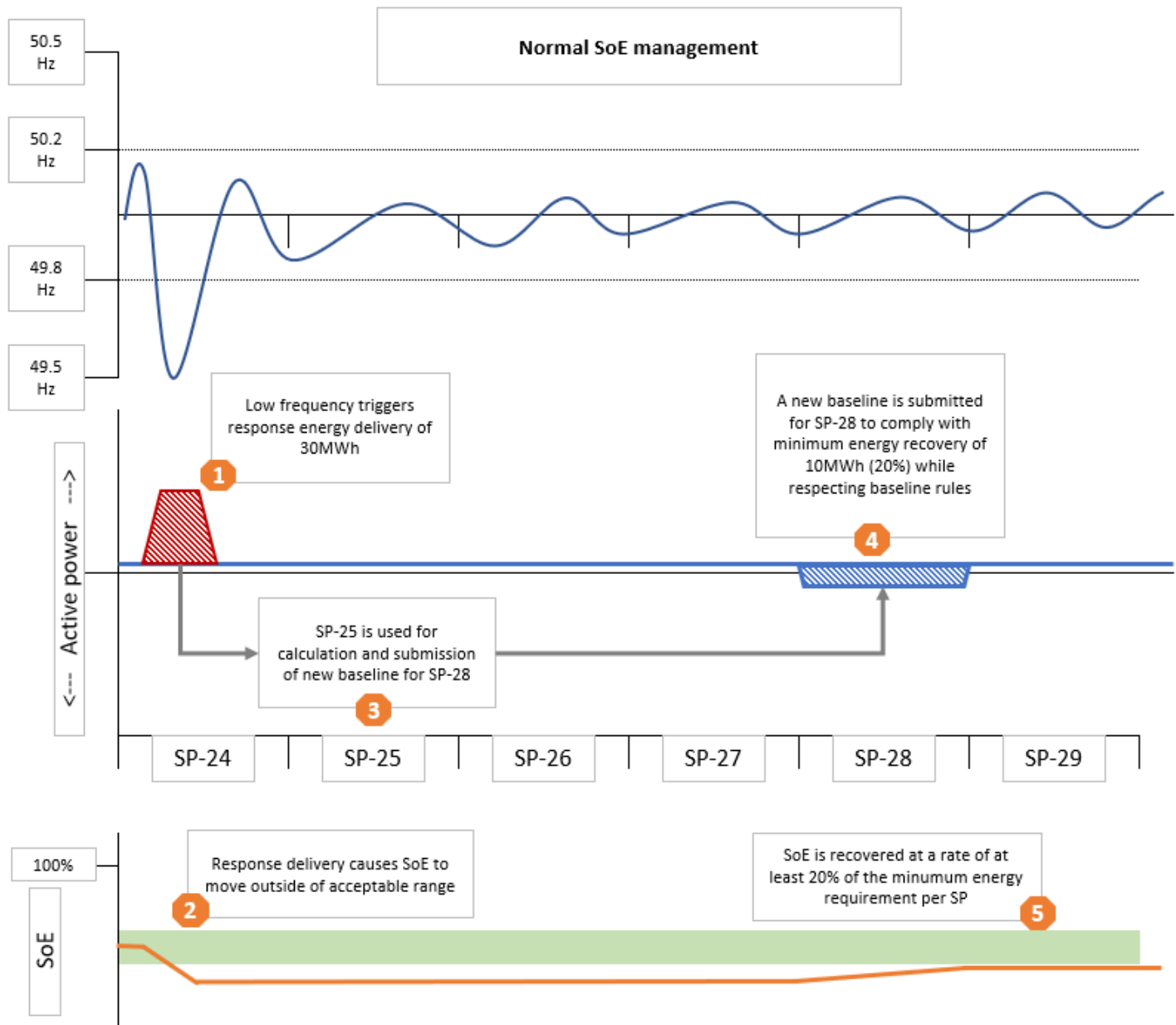
Minimum energy recovery requirement: 5MWh per SP - calculated as 6 minutes at full power: $(6/60) \times 50 = 5\text{MWh}$

Based on the above parameters, the Registered Service Provider should therefore manage the SoE of its energy limited unit as follows:

1. Begin the EFA Block with the capability to deliver 25MWh of energy in the relevant direction – in this case, generation when frequency is low. Delivery might occur in a single event lasting 30 minutes at full power or any number of shorter consecutive events (see Note 1 at the end of this section). The unit should not need to recharge or pause or cease delivery at any point before delivery of 25MWh of energy is complete.
2. At the start of each (and every) settlement period during that EFA Block, the Registered Service Provider should calculate the net energy delivery over the preceding settlement period. For example, if in SP24 the unit delivered 15MWh of energy as it responded to frequency, at the end of SP24 / start of SP25 the stored energy is now 10MWh.
3. The Registered Service Provider should submit a baseline to replenish at least 5MWh so that stored energy can begin to return to minimum requirement. The baseline should not exceed a level at which the unit is unable to continue to provide DR whilst following the baseline.
 - a. The Registered Service Provider should create and submit this baseline before the end of SP25 so that it can take effect from SP28. It cannot take effect any earlier because there is a 1 hour gate before baselines can apply – this is the convention applied to physical notifications in the BM and needs to be mirrored by non-BM providers to ensure fairness across all market players.
 - b. The baseline should replenish at least 5MWh because this is the minimum energy recovery requirement calculated as 20% of the minimum energy requirement (equal to 6 minutes at full power: $(6/60) \times 25 = 5\text{MWh}$).

This is illustrated below:





If there is no further response delivered in SPs 25-31 (i.e. frequency stays in the dead band 50Hz +/- 0.015) then the stored energy will be 15MWh at the end of SP28, 20MWh at the end of SP29, and completely restored to 25MWh at the end of SP30. At the end of every Settlement Period the Registered Service Provider assesses the level of stored energy and submits an appropriate baseline to recover that energy at a rate of at least 20% per Settlement Period.

The Registered Service Provider can choose to recover the energy faster but must ensure any baseline complies with the maximum ramp-rate rule. In our example the maximum ramp rate is calculated as 5% of the contracted quantity, so 2.5MW/min. Further explanation of maximum ramp rates is provided in the Annex.

The Registered Service Provider must also ensure that DR can be delivered at all moments during the service delivery day, including when ramping to or delivering against baselines for energy recovery (see Note 2 at the end of this section). This means a unit with name-plate capacity of 50MW cannot be contracted to deliver 50MW of symmetrical DR – it must retain some headroom for energy recovery.

NGESO is not specifying how much headroom a unit must hold; that will depend on unit characteristics unknown to NGESO, e.g. cycle efficiency (see Note 3 at the end of this section). The Registered Service Provider can assess what quantity of DR a unit can provide whilst considering:

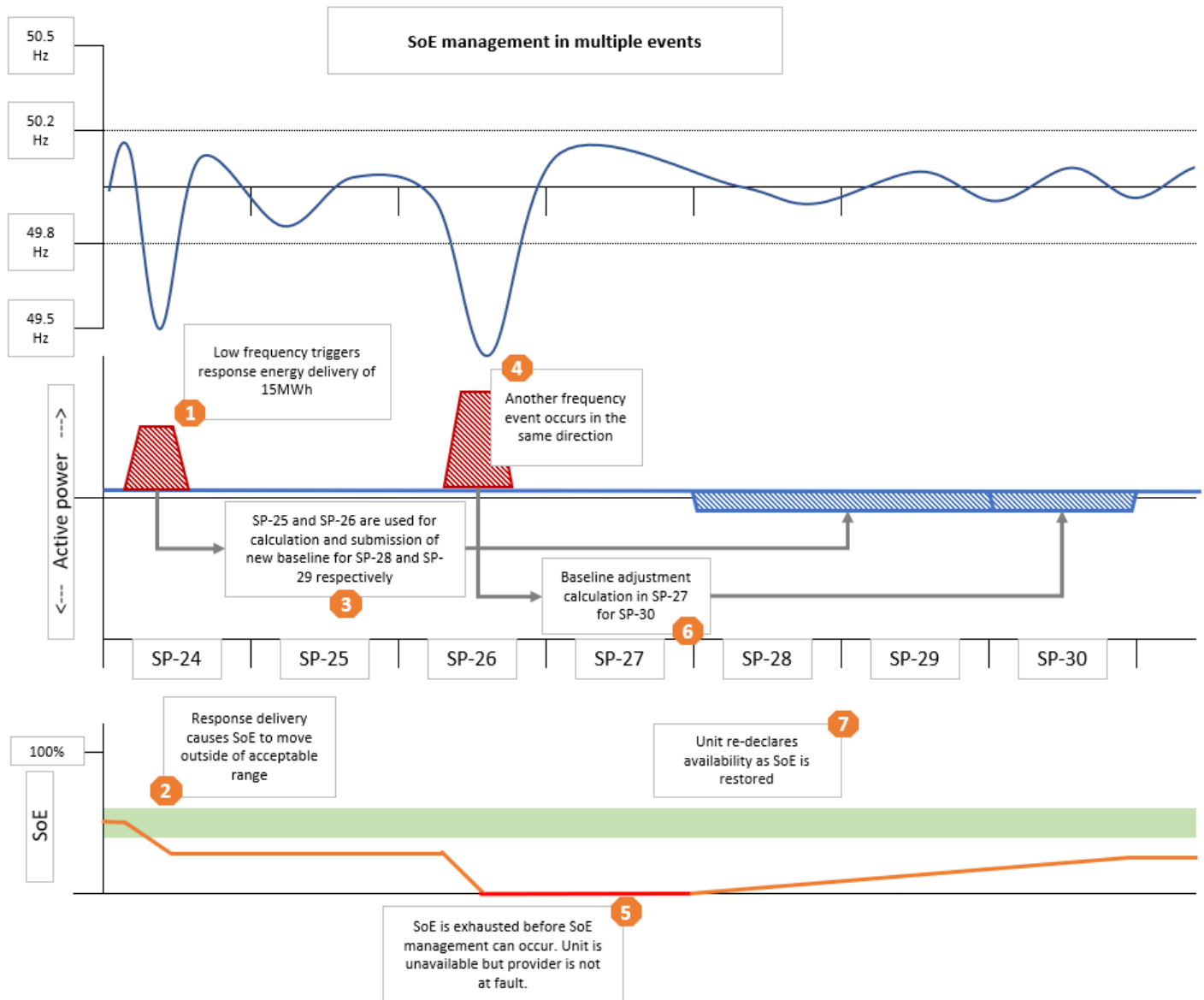
1. The requirement to be able to recover at least 20% of the minimum energy requirement in a single Settlement Period.
2. The maximum ramp rate for all baselines submitted during the EFA Block.
3. The unit efficiency and other technical and commercial considerations.

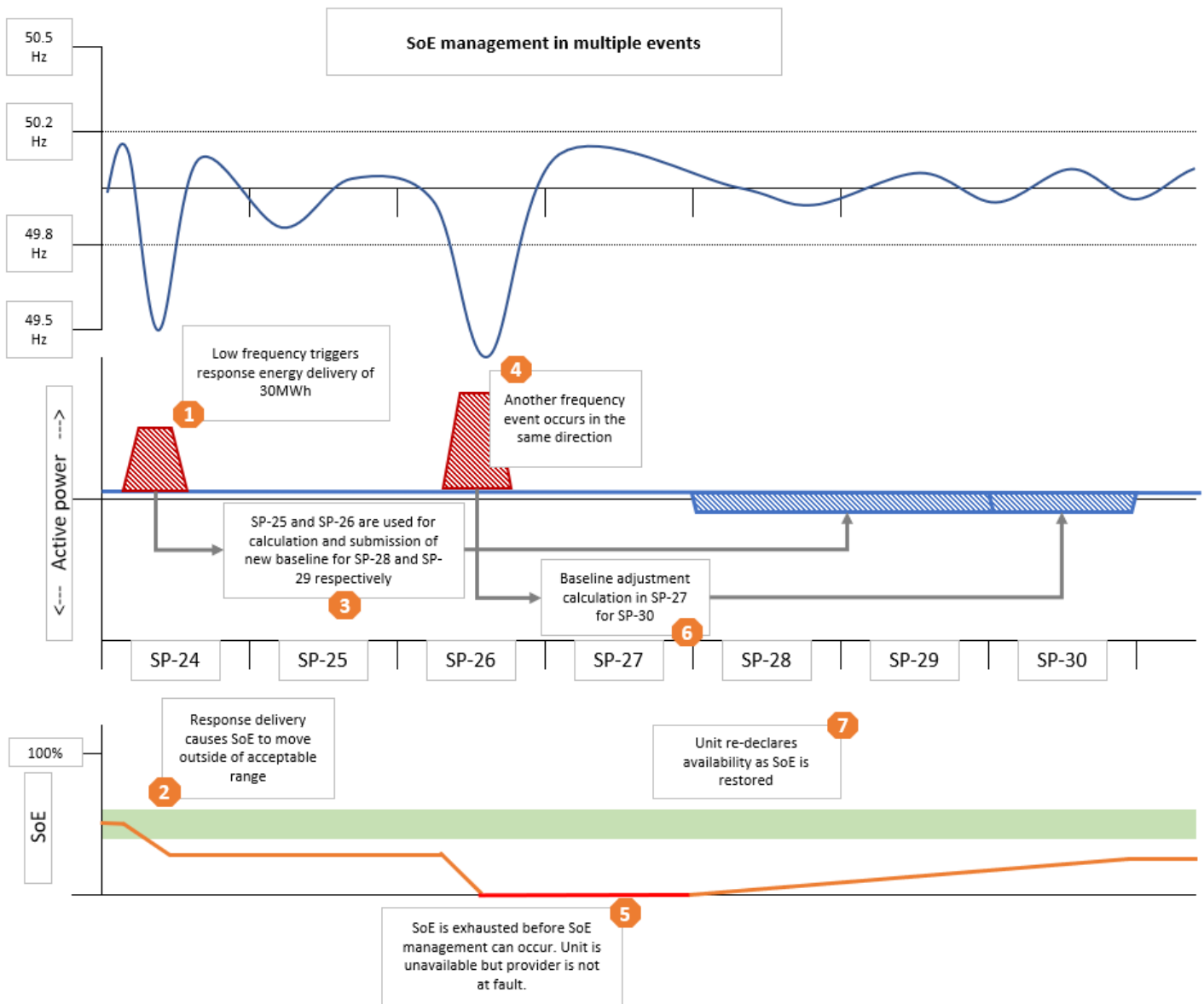
We can continue our example by considering the more likely scenario of additional response delivery during periods 25-31. In the example below there is another significant event in SP26 which ultimately exhausts the stored energy before the unit has an opportunity to recover via a baseline.

At the start of SP25 and SP26 the Registered Service Provider calculates and submits new operational baselines for SP28 and SP29 respectively. These are each sized to replace at least 20% of the minimum energy requirement. However, during SP26 there is another event which fully depletes the stored energy:

1. The unit is now unavailable. There is no penalty or performance measurement applied to the unit because it has followed the SoE rules and always sought to recover energy at the first opportunity. The unit should re-declare as available when SoE is restored to the minimum energy requirement (25MWh) or the end of SP32 whichever occurs first.
2. At the start of SP27 the unit should continue the process of calculating stored energy (empty at the end of SP26) and submitting a baseline, in this case for SP30. As always, the baseline must comply with ramp-rate limits and must be sized to recover at least 20% of the energy recovery requirement.

This is illustrated below:





In the example above there will be a portion of non-delivery in SP26 when the energy is fully depleted, but frequency is still in the delivery range ($<49.985\text{Hz}$). In cases where the SoE rules have been followed this non-delivery will not be subject to a performance penalty.

By this process of assessing the stored energy and submitting (and following) baselines the SoE can be managed to provide a high degree of certainty that energy limited units will always be able to respond adequately to frequency deviations.

Additional notes:

Note 1: For energy limited units, please take note that the energy requirement is defined in terms of MWh, not minutes. It can be calculated in terms of minutes at full power but should not be interpreted as 'maximum delivery time is 30 minutes'. Units are required to deliver at least the minimum energy requirement, this could be full power for 30 minutes but could also be 50% power for 60 minutes or 12.5% power for 240 minutes. There is no maximum delivery time unless/until the minimum energy requirement is fully delivered in net terms and/or the contracted MWh volume is less than 1MW (i.e. 1MW minimum contracted DR volume).

Note 2: For all Registered Service Providers, we will calculate your response delivery as a deviation from your submitted operational baseline. Therefore, the ability to accurately follow a baseline is paramount. In the dead band ($\pm 0.015\text{Hz}$) the unit should be operating at its baseline – this may be 0MW or any other value, particularly if the unit is following a baseline to charge/discharge for SoE management purposes. The difference between a unit's baseline at its maximum capacity should be greater than or equal to the contracted quantity of DR, otherwise it would not be able to deliver on its

obligation if frequency moved to $\pm 0.2\text{Hz}$.

Note 3: It is not possible or desirable for NGESO to prescribe the maximum quantity of DR that an energy limited asset can provide. We do not know the cycle efficiency (or how this might change over time) so we cannot prescribe how much headroom/foot room must be maintained to allow for adequate SoE management. We can only be sure that a xMW capacity unit can offer < xMW of symmetrical DR.

11. Balancing Mechanism Interaction

Registered Service Providers with BM units that are participating in the Balancing Mechanism may simultaneously provide DR. Further detail on the interaction between the Balancing Mechanism and the provision of DR is set out in the separate NGESO document entitled “Unlocking Stacking of BOAs with Frequency Response Services” as updated or replaced from time to time.

12. Data

Registered Service Providers will be required to submit both Operational and Performance Data, as outlined in the DR Service Terms.

All performance data is to be submitted via the Data Concentrator. Operational data should be submitted via BM systems (e.g. EDT/EDL) and for non-BM by any method made available by NGESO.

Details on how to connect to these platforms and further technical detail can be found on the Dynamic Regulation webpage. The published files contain high level overview and more in depth technical details are shared on a one to one basis securely. Details to access these are outlined in the documents. These are alongside other existing BM systems such as EDL/EDT and the Wider Access API for Physical Notifications and other Dynamic Data submissions required under the Grid Code for BM units.

13. Transparency

NGESO will seek to publish data in line with our other balancing services in the Monthly Balancing Services Summary (MBSS). NGESO will also seek to provide a service specific report covering performance of the DR service and daily auction results. NGESO website shall be used for publishing documentation on the DR service.

14. Capacity Market

In line with changes to the Capacity Market Rules approved by Ofgem on 5 July 2021, and effective from the 2021 Capacity Market Participation round, Dynamic Regulation will be treated as a “Relevant Balancing Service” for the purpose of the Capacity Market Rules, and accordingly delivery of Dynamic Regulation will trigger an adjustment pursuant to those rules where an Eligible Asset is part of a CMU (as defined in the Electricity Capacity Market Regulations 2014 as amended).

15. Active Network Management Zones

Eligible Assets will not normally be registered by NGESO for participation in DR if they have a condition in their DNO connection agreement whereby they are signed up to an Active Network management (ANM) Scheme / Flexibility Connection. However, NGESO will consider this on a case by case basis and may (at its 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). NGESO shall continue to keep this under review and any changes to this position shall be consulted accordingly.

16. Transitional Arrangements

This document and the associated documentation describe a new DR service which has been “soft launched”, whilst certain underlying systems and processes are fully developed. Initially, therefore, transitional arrangements currently



apply which are not intended to feature as part of the DR service long term.

These transitional arrangements are described below, and they qualify and/or supplement the DR Auction Rules and DR Service Terms until further notice or as described below:

- For a period of 6 months, the DR Performance Data to be provided in respect of each Response Unit as more particularly described in paragraph 15.3 of the DR Service Terms shall be permitted at a granularity of one measurement per second (1 Hz). Following this period, such DR Performance Data will be required to be provided at two (2) measurements per second (2Hz).
- The 6 month period above applies from the first live DR Service Day.

Annex 1

Baselines for energy limited assets – additional guidance

This Annex offers further guidance on how energy limited units participating in Dynamic Regulation should calculate their baseline ramp-rate limit. These rules apply to both operational and performance baselines.

All DR providers must submit baselines, and there are specific rules for energy limited providers. The baseline rules are outlined in paragraph 6 of the DR Service Terms, and at paragraphs 6.8 to 6.13 there are rules specifically addressed at energy limited providers.

For energy limited providers, these rules impose a maximum ramp-rate on any submitted baseline. The current limit is 5% of contracted quantity per minute (i.e. a 100MW DR contract could change its baseline by a maximum of 5MW/min). The ramp rate limit is required to smooth the impact of state of energy (SoE) management. It is plausible that battery storage may eventually be providing in excess of 500MW of DR, and therefore the ramp rate limit means that any coordinated SoE management is restricted to a rate of 25MW/min (5% of 500MW). The alternative is that all 500MW could decide to charge instantaneously (~500MW/min) at the first opportunity after a low frequency event.

To emphasise, this requirement to observe a maximum ramp-rate applies only to energy limited providers (see paragraph 6.8 of the DR Service Terms).

There is explanation in paragraph 6.9ii of the DR Service Terms as to how this maximum ramp-rate restriction must be observed where there are two adjacent EFA Blocks in contract with different MW quantities, and at paragraph 6.9iii where the Response Unit is BM Participating and is the subject of a Bid-Offer Acceptance.

Furthermore, as referred to in paragraph 6.9i of the DR Service Terms, the maximum ramp rate will depend on whether the Response Unit is providing DR-low or DR-high or both, and whether its Baseline is showing either an increase or reduction in level of Active Power Output or an increase or reduction in level of Demand.

Initially the DR contract documents in place for soft-launch envisage DR-low delivery only, meaning that the contract quantity of DR-high can be zero. This has created some uncertainty as to how maximum ramp-rate restriction should currently be observed. For example, as there is no HF contract quantity how should 'upwards' or 'discharging' ramp rates be calculated?

Further explanation is therefore provided below as to how NGESO envisages application of paragraph 6.9i to the asymmetric DR-low and DR-high scenario. This explanation is given by reference to two scenarios:

- Unit contracted for asymmetrical quantities of HF + LF
- Unit contracted for either HF or LF only

In both these scenarios the rules are described in relation to type of baseline submitted. A baseline must have a start point and an end point, therefore there are four possible implementations of a baseline:

- Less positive (e.g. from +10MW to +5MW)
- More positive (e.g. from +60MW to +85MW)
- Less negative (e.g. from -20MW to -7MW)
- More negative (e.g. from -10MW to -50MW)

When considering these scenarios, reference should be made to the definition of maximum ramp-rate found in the DR Service Glossary:

in relation to any **Response Unit** which is **Energy Limited** and to any **EFA Block**, the maximum ramp rate permitted at any point within an **Operational Baseline** and **Performance Baseline**, calculated as five percent (5%) of **Contracted Quantity**, as more particularly referred to in the **DR Service Terms**;

How to read the scenarios below

Reading from left to right indicates the progression of the baseline over time.

All the examples use a bi-directional unit capable of generation (pink) and demand (green).

The black line indicates a baseline that is not impacted by the ramp rate limitations of the DR contract.

Red lines are used to show ramping baselines that have been calculated/limited by the ramp rate limit derived from the contract quantity of DR-HF.

Blue lines are used to show ramping baselines that have been calculated/limited by the ramp rate limit derived from the contract quantity of DR-LF.

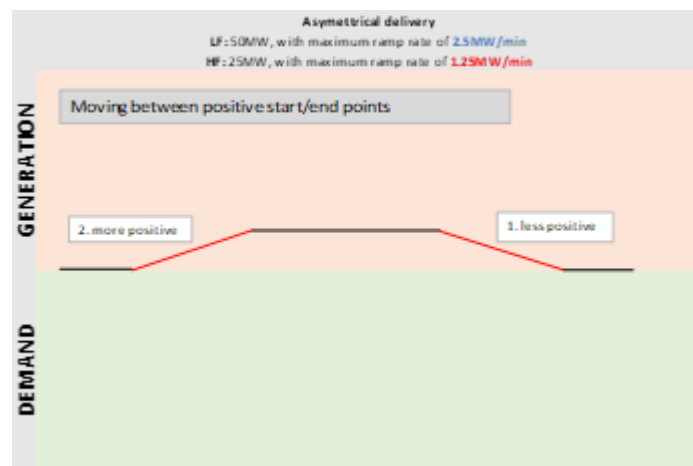
In all the examples the unit is contracted for more LF than HF, so the (blue) LF ramp rate is faster than the (red) HF ramp rate.

Each ramping baseline is labelled as one of the four possible implementations described above.

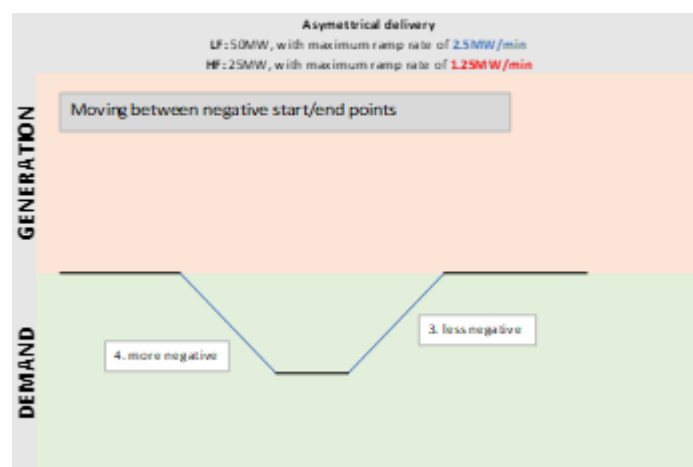
Asymmetrical delivery of HL + LF

In this scenario we have a unit providing different quantities of HF and LF, hence there are two different ramp rates to be applied (one calculated from the HF quantity and one from the LF quantity).

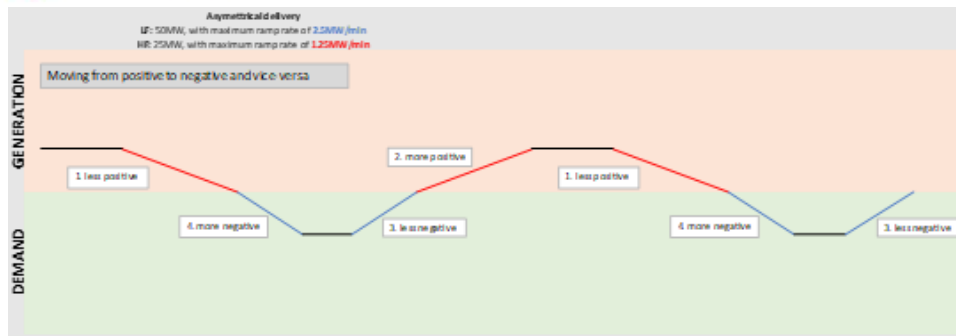
In the **first** example the ramp rates are calculated from the quantity of HF. The specific baseline change illustrated is typical of a unit managing its SoE due to delivery of HF (i.e. it needs to generate to reduce its stored energy after responding to high frequency).



In the **second** example the ramp rates are calculated from the quantity of LF. The specific baseline change illustrated is typical of a unit managing its SoE due to delivery of LF (i.e. it needs to charge/demand to increase its stored energy after responding to low frequency).



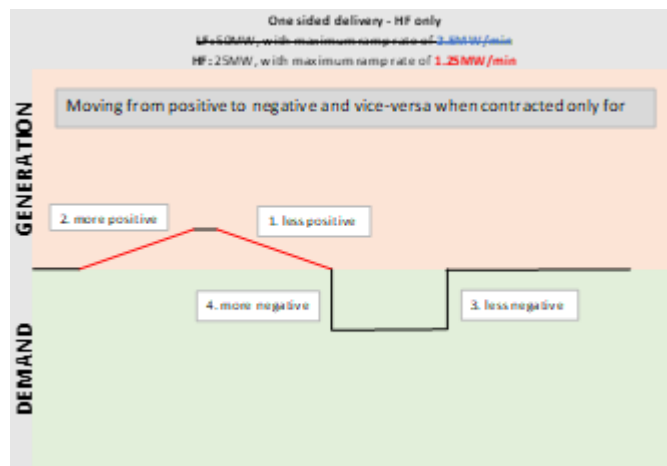
In the **third** example the ramp rates change as they go through zero, from positive to negative and vice versa. This kind of profile is not expected for normal SoE management, but the rules have been designed to allow it so as to facilitate units that wish to stack energy arbitrage on top of service provision.



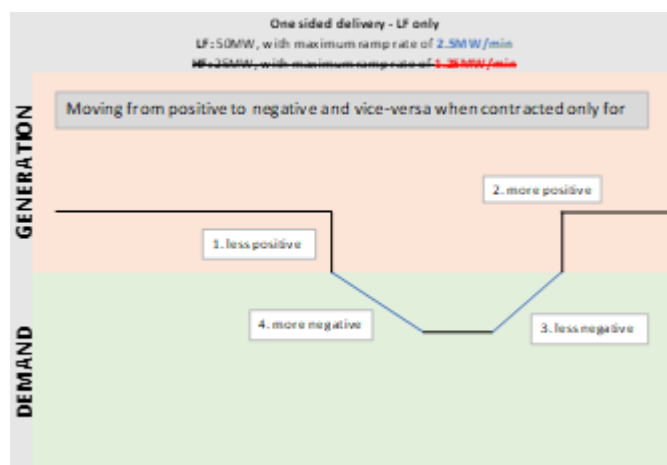
One sided delivery of HL or LF

In this scenario we have a unit providing only one of HF or LF, hence there is only one ramp rate to be applied (calculated from either the HF quantity or from the LF quantity).

In the **first** example we see how the baseline related to SoE management is limited by the quantity of HF (the red baseline). The baseline to increase demand is unrestricted by the DR ramp rate limitation (other Grid Code limits will still apply).



In the **second** example we see how the baseline related to SoE management is limited by the quantity of LF (the blue baseline). The baseline to increase generation is unrestricted by the DR ramp rate limitation (other Grid Code limits will still apply).



Why is there no ramp rate limit in the one-sided examples?

In the examples where a unit is providing only HF or LF there is no ramp rate limit (other than Grid Code) on baselines that should not be impacted by provision of the DR service. Providers doing only HF for example would not be expected to exhibit coordinated 'charging' baselines, therefore there is no need to limit their baselines in that direction.

Codifying the rules

The rules illustrated above can be written in relation to each of the four implementations of baselines:

Less positive: If no HF contract then no additional requirement, otherwise = HF contract limit

More positive: If no HF contract then no additional requirement, otherwise = HF contract limit

Less negative: If no LF contract then no additional requirement, otherwise = LF contract limit

More negative: If no LF contract then no additional requirement, otherwise = LF contract limit

Where 'no additional requirement' is used to indicate that the DR contract places no rules on baselines but other obligations may be required as per Grid Code and other service agreements.

This is further shown in the table below.

	DR-low only		DR-high only		DR-low and DR-high	
Operational State	Active Power Output	Demand	Active Power Output	Demand	Active Power Output	Demand
Baseline showing reduced Output	No additional requirement		Ramp rate defined by the HF contract quantity		Ramp rate defined by the HF contract quantity	
Baseline showing increased Output	No additional requirement		Ramp rate defined by the HF contract quantity		Ramp rate defined by the HF contract quantity	
Baseline showing increased Demand		Ramp rate defined by the LF contract quantity		No additional requirement		Ramp rate defined by the LF contract quantity
Baseline showing reduced Demand		Ramp rate defined by the LF contract quantity		No additional requirement		Ramp rate defined by the LF contract quantity