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Dynamic Response Services

Provider Guidance v.9

October 2024

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National Energy System Operator

Version History

Version	Added Information	Date Published
V2	Clarification of unit availability in Performance Monitoring, Performance data reporting by different service (table) added to Performance Monitoring, K_e Factor clarification added to performance calculations.	July 2023
V3	Joining the service (high level user journey, First time user registration, State of Energy BM&NBM, Data and Transparency, Settlements (Settlements, Settlements Process).	August 2023
V4	Maximum capacity added to Overview of the Services, Performance Monitoring (Arming and Disarming), Energy Requirement and Duration, Ramp Rates, Instruction Codes updated and examples added, Performance Monitoring (stacking) with examples.	September 2023
V5	Order Submission Process.	October 2023
V6	De-registration of units, Monitoring of Bi-directional Contracts, update of performance monitoring formula post EAC go live, removed 'post EAC go live' section and moved into main section post EAC go live, Performance Monitoring (Sacking) different clearing price example updated.	January 2024
V7	Table of Acronyms added as appendix	March 2024
V8	Interactions with other markets section added	July 2024
V9	SoE guidance updated, Ramp Rates removed, Instruction Codes updated.	November 2024

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Contents

The Dynamic Services

The information in this guidance is tailored to support new, existing and transitioning providers of the New Dynamic Services. This document complements the service's contractual documents: the Service Terms, Procurement Rules and Balancing Services Glossary. In the event of any conflict or inconsistency between this document and the contractual documents, the latter shall prevail.

Dynamic Containment (DC), Dynamic Moderation (DM) and **Dynamic Regulation (DR)** make up our new suite of Dynamic Services. Together they work to control system frequency and keep it within our licence obligations of 50Hz plus or minus 1%. DM provides fast acting pre-fault delivery for deviations between +/- 0.015 Hz and 0.2 Hz. DR is our staple slower pre-fault service. DC is our post-fault service.

Please note this does not include our Dynamic Firm Frequency Response (DFFR) service which has been replaced with these new dynamic services has now been phased out.

DC is a fast-acting, post-fault service designed to arrest frequency in large-loss, low inertia scenarios. It delivers energy proportionally to the change in frequency, within ±0.5 Hz of the target frequency value. It is particularly suited to act in the event of a sudden demand or generation loss.
The DC low frequency ("DCL") product went live in October 2020, followed by the launch of the DC high frequency service ("DCH") in October 2021.

DM and DR are pre-fault services wherein providers make automatic adjustments in generation (or demand). DR provides a constant power response across the operational frequency range, reaching full delivery at a ±0.2 Hz frequency deviation. DM responds between ±0.1 Hz and ±0.2 Hz, providing additional power to stabilise frequency as it moves closer to operational limits. DM and DR were launched in March 2022.

Following the Article 18 of the EBGL consultation which concluded on 28 October 2022. Our proposal to deliver a merged set of contractual documents for the three aforementioned services was approved by Ofgem. The documents include merged Service Terms, which describe the requirements for the provision of each of the services, and Procurement Rules, which describe the eligibility rules for participation in the services.

This guidance is published to support the onboarding of the new terms by our providers. It is designed to give additional information on the rules and recommendations regarding the delivery of these services, along with relevant use cases. This document will be updated outside of the response reform annual development cycle to allow for more frequent updates.

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Service Criteria

Overview of the services

All three New Dynamic Services – **DC, DM and DR** – share the characteristics described below.

A minimum response capacity of 1 MW is required per response unit.

A maximum response capacity of 100 MW for DC and 50 MW for DM and DR is permitted per response unit.

Automatic activation is required from either generation or demand, or energy limited (e.g. battery) assets.

Energy limited assets have to comply with the **"state of energy" management rules**.

Contract delivery is done across four-hour EFA Blocks.

Sell orders may only be submitted in whole MWs.

We procure **low and high frequency services** separately.

Participation is open to **both Balancing Mechanism (BM) and non-BM** registered assets.

All services include the capability to **disarm and re-arm** in response to an instruction from NESO.

Aggregation is possible when assets sit behind same GSP Group (subject to technical assurance being carried out on the risks associated with moving to GSP Group).

Service providers need to have the necessary data transfer capabilities to provide both **operational and performance data**.

Payments are provided for availability only.

Dynamic Containment (DC)

This service is designed to help contain frequency within statutory limits +/- 0.5 Hz from the target frequency of 50 Hz.

Dynamic Moderation (DM)

This service is designed to help contain frequency within operational limits +/- 0. 2Hz from the target frequency of 50 Hz.

Dynamic Regulation (DR)

This service is designed to help contain frequency within operational limits +/- 0.2 Hz from the target frequency of 50 Hz.

Service Requirements

In order to register as a provider for one or several of the Dynamic Services, you are required to test your assets and submit proof of its capability to deliver, according to the following service specifications. Please refer to the next section of this guidance for more information on testing.

Table 1: DC, DM and DR service specifications

Service specification	Description	DC	DM	DR
Initiation time	The maximum time between a change in frequency and change in the delivery of response	0.5s	0.5s	2s
Max time to full delivery	The maximum time between frequency deviation occurring and delivery of the saturation quantity	1s	1s	10s
Delivery duration	Time that an energy limited provider must be capable of sustained delivery	15 minutes	30 minutes	60 minutes

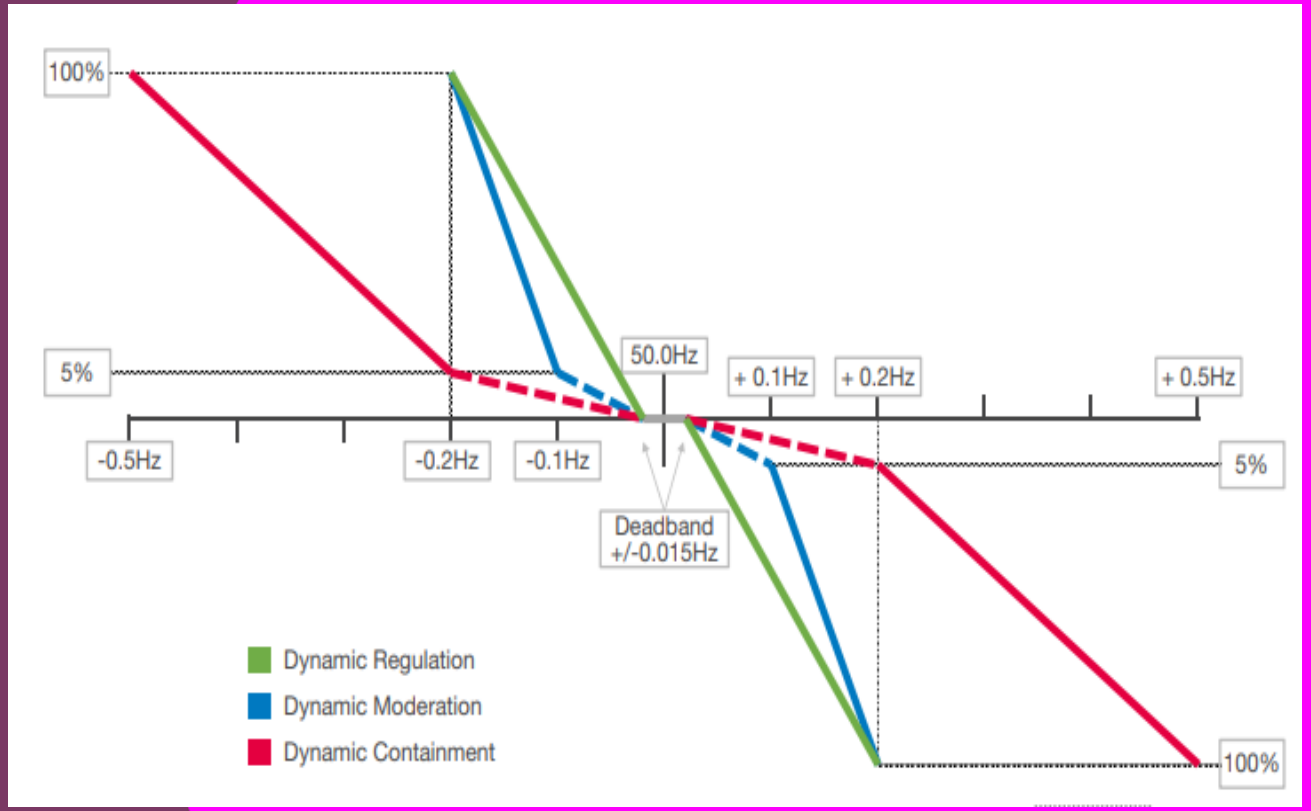

Figure 1: DC, DM and DR delivery requirement curves

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Joining the Services

High Level User Journey

Table 2: High level overview of the user journey and the relevant NESO Systems

Stage	Explore	Onboarding /Account Management	Participate	Contract Management	Schedule / Dispatch	Review	Payment
User Journey	Gather data and information Build business case Understand codes, markets and connections	User, company, unit asset registration Pre-qualification Agent set up Contract Accession Asset / Unit versioning User Management	Tender Submission Action Submission Co-optimisation	Contracts awards and status Manage contracts	Availability management Instructions	Data submission / collection	Performance monitoring Settlement Penalties Disputes Financial position
NESO Systems	DEP	SMP	EAC SMP	SMP	OBP	DEP SMP	STAR SMP

Acronyms: DEP – Digital Engagement Platform, EAC – Enduring Auction Capability, OBP – Open Balancing Programme, STAR – Settlement and Revenue (System)

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First Time User Registration

If you and your organisation are new to NESO and to the SMP Portal, then it is required that you register directy via the portal using the following instructions.

The User should visit and bookmark the following link: SMP Login

As a first-time user you will need to click the "Register New Account" button. Users will be navigated to the first 'screen' to capture Registration.

Registering New Primary User

In order to access the SMP Portal, it is expected that upon initial registration the main or 'primary' contact (user) at your organisation/company will undertake the registration steps.

Registration involves submitting one's contact details and their organisation/company details. The successive order is contact details followed by company details.

When entering email addresses or telephone numbers, standardised formats are expected, if a User/Contact does not submit field values compatible with the expected format then the field will be flagged in a red border with a prompt instruction. For example, if an email address has been submitted with the incorrect format.

Once all of the fields have been completed on the User/Contact section, the "Next" button will no longer be shaded grey, instead it will be converted into a blue 'button', allowing you to proceed to the next step.

Registering the Primary User's Company

The 'Register new Account' stage involves two pathways depending on the Company Status. If the User/Contact's organisation is a UK Limited Company, they select the first checkbox. If the User/Contact's organisation is a non-UK Company then they select the second checkbox.

Once the option is selected, the user clicks on the "Next" Button.

Registering a UK Company

The User/Contact will be prompted to search for the Company Name and the Company Registration Number.

For Company Name - they will be expected to enter the name, which will trigger a lookup search/listing of similar names for the user to choose from.

For Company Registration Number - they will be expected to enter the exact reference number, which will trigger a lookup search/listing for the user to select and confirm.

Please note that only valid and accurate Registration Numbers will be accepted and appear in the search exercise.

For Company Registration Number - they will be expected to enter the exact reference number, which will trigger a lookup search/listing for the user to select and confirm.

Please note that only valid and accurate Registration Numbers will be accepted and appear in the search exercise. If your Company is a UK Limited Company and the search listing is unsuccessful, you will need to reach out to your NESO Account Manager by email

Once a match has been found, the User/Contact must select the "Submit" button to proceed to the next step.

If the search result is incorrect or the User/Contact wishes to undertake a new search, then they are expected to click on the "Remove Company" link to refresh the search functionality.

Once the search result is correct, then the User/Contact selects the "Submit" button on the bottom right right-hand corner of the screen.

For more information on this process, or for information on registering a non-UK company click here.

For technical support please contact: commercial.operation@nationalenergyso.com

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Order Submission Process (EAC)

The following section will give a step-by-step guide to submitting orders on EAC. If you and your organisation are new to NESO and have yet to register to SMP, then it is required that you register there first, see page 10 for full instructions on how to do so. All participants must then be registered as a user for EAC, even after registering units on SMP.

After registering for EAC and logging in with 2-factor authentication the first step is to select that auction that you would like to bid into. All auctions with gates open can be found under the 'Auctions' tab.

After you have selected the auction that you would like to bid into you will need to select the unit you would like to use from the drop-down menu.

Following this you will start to build and add your baskets (defined by EFA block). You will give your basket a name and a family name if these are looped baskets and add in the relevant information such as price volume and any child order or substitutable child orders as required.

Once all of the relevant information has been added the bid can be submitted.

After the auction results can be found in the results tab for your relevant unit, all results will be published on the Data Portal for all units.

Please note that bids can also be submitted via API, to obtain API credentials please contact NESO.

Figure 2: View of upcoming auctions

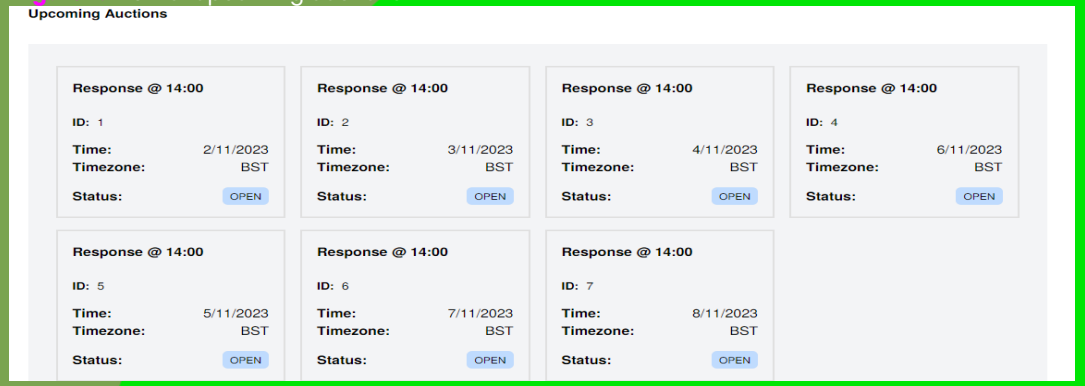

Figure 3: Button to create new basket

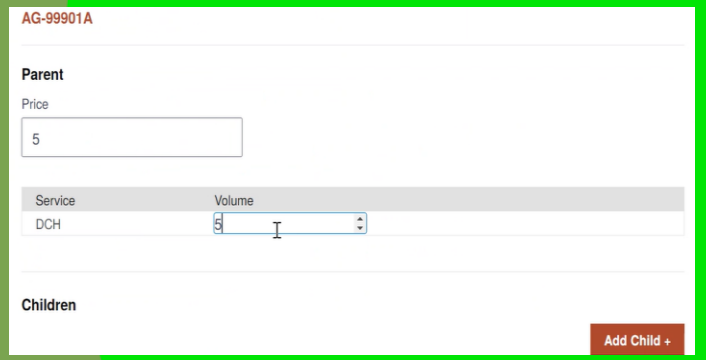

Figure 4: Adding parent and child orders to the basket

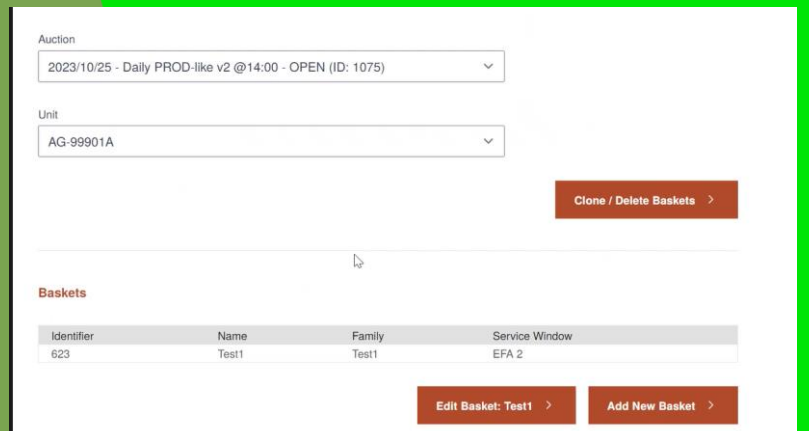

Figure 5: Adding parent and child orders to the basket (continued)

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Technical Guidance

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Testing

Prior to participating in frequency services, all assets will need to have passed the pre-qualification testing described in the procurement guidelines and supporting documents.

Asset testing consists of 4 types of tests, **Duration**, **Frequency Sweep**, **Step** and **Live system** testing. These tests are designed to show that the asset can deliver the service in line with each individual service design specifiactions. These tests can be conducted on an individual assets level or as an aggregated unit.

Asset testing is to be signed off by a technical engineer appointed by the provider and the completed test report is then to be sent to us.

In addition to service testing the asset providing the service as part of onboarding, the provider will need to test for Operational Metering, Performance Monitoring through the Data Concentrator, Ancillary Service Dispatch Platform (ASDP) testing if it is a non-BM unit and any requirement needed if the Unit is registered as a BM unit. All information regarding these test can be found on the NESO website.

An example of a service design is provided below. Testing is needed to confirm that a particular asset can deliver under these requirements.

Service description - DC

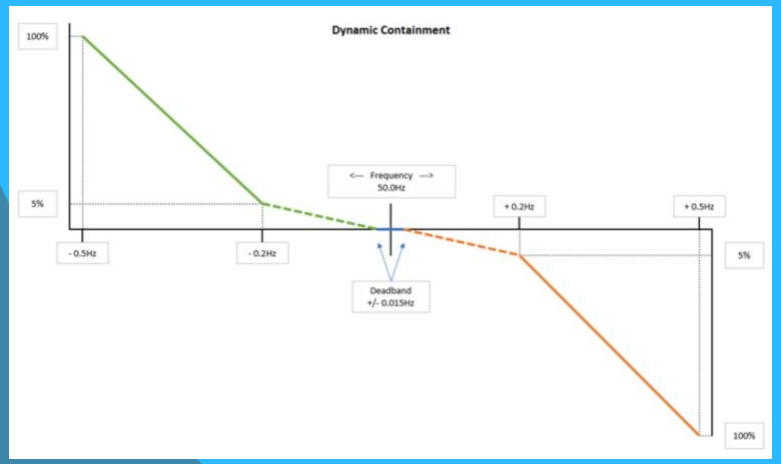
DC is a fast-acting frequency response service to contain frequency within the statutory range of +/-0.5Hz in the event of a sudden demand or generation loss. The service delivers very quickly and proportionally to frequency deviation.

Table 3: Dynamic Containment service specification

Service specification	Details
Deadband delivery	0% (+/- 0.015Hz)
Small linear delivery	Between 0.015Hz and 0.2Hz (maximum of 5% at 0.2Hz)
Knee point activation	+/- 0.2Hz is 5%
Full delivery	+/- 0.5Hz is 100%
Linear delivery knee point	0.2Hz
Full activation	0.5Hz
Full delivery	1s (but no faster than 0.5s)

See the Service Terms and supporting documentation for more details.

Figure 6: Dynamic Containment delivery requirement curve



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Performance Monitoring

This section provides information on the application of the performance monitoring methodology for the New Dynamic Services. Some examples are given for particular scenarios including Low only services, High only services and Low and High services. Reference of the ***PerfMon_Excel*** calculator sheet provided with this document is used throughout the section. In the event of any conflict or inconsistency between this document and the Service Terms, the latter shall prevail.

Lags and ramp limits

The lags and ramp limits for each of the dynamic services are defined in ***Table 4***.

Table 4: Lags and ramp limits.

Service	Maximum initiation time $T_{iMAX}(s)$	Maximum time to full delivery $T_{dMAX}(s)$	Lag upper bound tolerance $tol_{iMAX}(s)$	Ramp time upper bound $tr_{max}(s)$	Ramp rate lower bound $rr_{min}(s^{-1})$
DC	0.50	1	0.05	0.50	2
DM	0.50	1	0.05	0.50	2
DR	2	10	NA	8	0.125

Service Terms

Recalling the main definitions for Performance Monitoring from the Service Terms:

Availability Payments

From the Service terms, the payment formula is:

$$S_{aij} = Round\left(\left(P_{aj} - \left(\left(1 - K_{aij}\right) \times PF_{aj}\right) \times V_{aij} \times 0.5 \times F_{aij}\right), 2\right)$$

Where

- S_{aij} is the settlement value calculated in respect of Response Unit i for the relevant Auction Product a and Settlement Period j;
- P_{aj} is the applicable Market Clearing Price in £/MW/h for the relevant Auction Product a and Settlement Period j;
- V_{aij} is the Contracted Quantity in MW in respect of Response Unit i for the relevant Auction Product a and Settlement Period j;
- F_{aij} is zero (0) if Response Unit i has any period or periods of unavailability for Auction Product a within Settlement Period j, and is one (1) otherwise;
- K_{aij} is the performance factor in respect of Response Unit i for the relevant Auction Product a and Settlement Period j, and is defined in this Schedule 3 below; and
- PF_{aj} is the settlement adjustment price in £/MW/h applicable to Auction Product a and Settlement Period j, and is which is calculated as follows:
  - The settlement adjustment price is equal to the Market Clearing Price if the Market Clearing Price is greater than or equal to [x2];
  - The settlement adjustment price is equal to -1 (negative one) times the Market Clearing Price if the Market Clearing Price is less than or equal to [x1];
  - The settlement adjustment price is equal to [X] if the Market Clearing Price is between [x1] and [x2].

Table 5: Performance data reporting by different service

Service	Performance Data
DC	20Hz
DM	20Hz
DR	20Hz or 2 Hz
Stacking Services	20Hz

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Performance Calculations - Overview

The figure below shows an overview of the performance monitoring calculations methodology for all three dynamic services:

$$Si_e = \left(\sum_j^{CEB} Round(Pij_e \times Vij_e \times 0.5) \times Fij_e\right) \times K_e$$

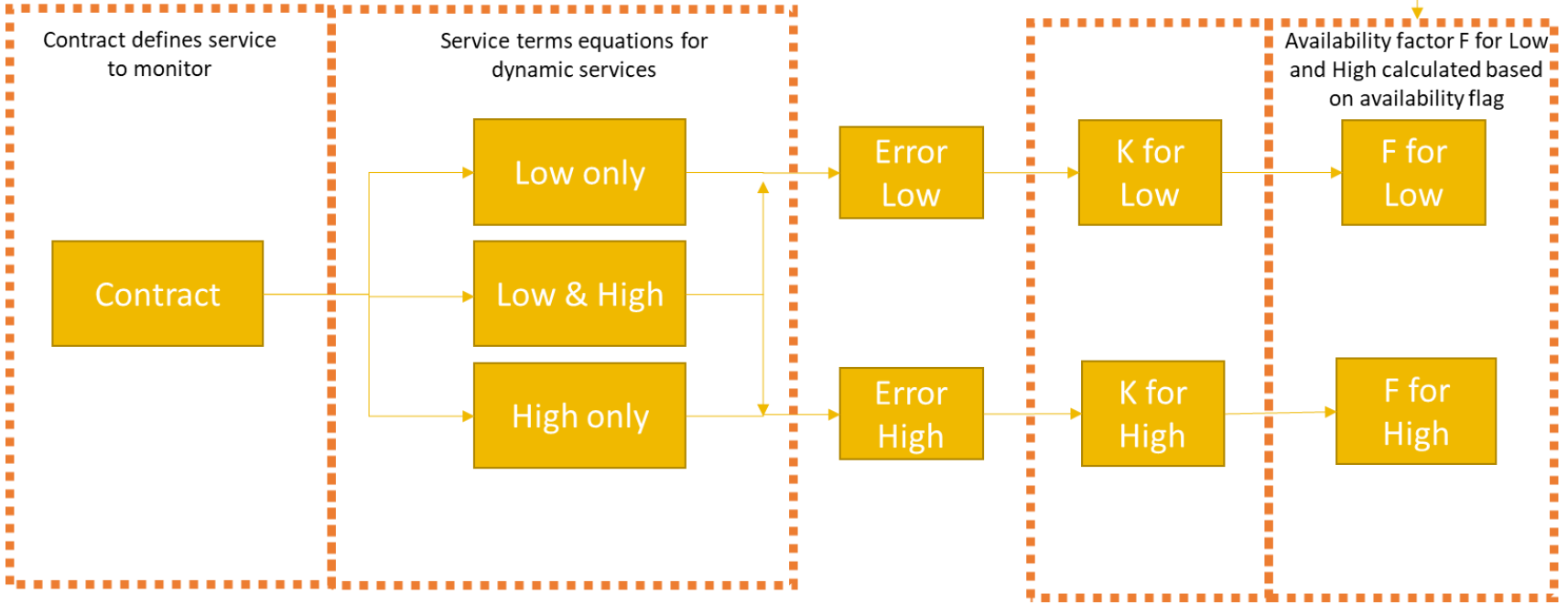

Figure 7: Overview of the performance monitoring methodology

Performance Calculations (1/3)

Stages

1) Contract: In the first stage, contracts are gathered and processed. This defines the services to be monitored.

If unit DC-UNIT1 has a contract for EFA 1 on the 1st of February 2023 the following information could be processed and DC-UNIT1 will be monitored for DC Low only service with a contracted volume of 10MW for EFA 1 on 01/02/2022.

Company	Unit Name	EFA Date	Delivery Start	Delivery End	EFA	Service	Cleared Volume	Clearing Price	Technology Type
DC COMPANY1	DC-UNIT1	01/02/2023	2023-01-31T23:00:00	2023-02-01T03:00:00	1	DCL	10	1	Batteries

2) Performance bounds equations: Based on the contracted service, the system selects the corresponding equations for the performance bounds calculation, as defined in the Service Terms.

For the above example, the equations used for a Low service contract are:

$$UB_{LF}(t) = RLD(\, R_{LF}(F^{lower}(t)), rr_{min}\,) \times P$$
$$LB_{LF}(t) = RLU(\, R_{LF}(F^{upper}(t)), rr_{min}\,) \times P$$

Performance Calculations (2/3)

Stages

3) Settlement Period (SP) Error: Errors per SP are then calculated based on the schedule 2 of the service terms. The contracted service also defines if there are errors for Low-only, High-only, or Low and High service. Errors are first calculated using the rolling minimum error formula, the lengths of the rolling minimum windows are provided in *Table 6*.

$$E = \max_{m} \begin{pmatrix} rolling\_minimum\ es_{m} \\ over\ x\ seconds \end{pmatrix}$$

Where x is the length of the rolling minimum window defined by the contracted service as shown in *Table 6.*

Examples of error calculations are given the following 'Use Case' sections, for each of the contracted services.

Table 6: Rolling minimum window length by service.

Service	Rolling minimum window length (s)
DC	0.2
DM	0.2
DR	2

4) Settlement Period (SP) k factor: After errors have been calculated, a k factor is assigned to each SP. The contracted service will also define if there are k factor for Low-only, High-only or Low and High contract

Performance Calculations (3/3)

Stages

5) Settlement Period (SP) Availability: Availability is calculated based on the availability flag submitted in the performance files. This then defines the availability factor Fij_e of the payment formula per SP. Availability is first segregated into Low and High service by converting the decimal number into binary, this will determine which service is available, for example:

Table 7: Availability flags..

Availability flag	DR High bit	DR Low bit	DM High bit	DM Low bit	DC High bit	DC Low bit
0	0	0	0	0	0	0
1	0	0	0	0	0	1
2	0	0	0	0	1	0
3	0	0	0	0	1	1
4	0	0	0	1	0	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮
48	1	1	0	0	0	0

If a contracted dynamic service is fully available for the full duration of the SP, then a value of 1 is assigned to the availability factor Fij_e. On the other hand, if the contracted service is partly available for the SP, then a value of 0 is assigned to Fij_e.

Recalling the service terms:

"Fij_e is zero where there is any period or periods of unavailability within Settlement Period j during the relevant Contracted EFA Block e, otherwise is Fij_e 1."

This workflow will be broken down per contracted service below, e.g. for dynamic Low-only, High-only and Low and High service.

6) EFA K factor: The K factor for the contracted EFA block e is calculated using the formula below. This calculates the minimum k factor that occurred within the EFA block.

$$K_e = \min_j k_j$$

K_e factor calculation uses available data to derive the factor. Any unavailability will impact the payment for the affected settlement period.

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Performance Monitoring

Dynamic Service Low

1) Contract: In the first stage, contracts are gathered and processed. This defines the services to be monitored.

Example, assume that the following contract is given:

Company	Unit Name	EFA Date	Delivery Start	Delivery End	EFA	Service	Cleared Volume	Clearing Price	Technology Type
DC COMPANY1	DC-UNIT1	01/02/2023	2023-01-31T23:00:00	2023-02-01T03:00:00	1	DCL	10	1	Batteries

2) Low service only performance bounds:

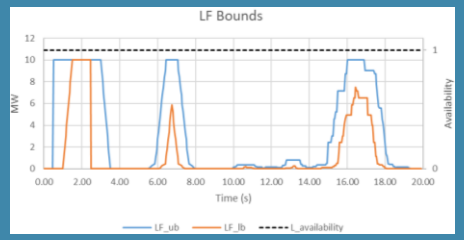

Figure 6: Example of performance bounds for DC Low only.

Calculated using the Low service equations:

$$UB_{LF}(t) = RLD(\ R_{LF}(F^{lower}(t)), rr_{min}\ ) \times\ P$$
$$LB_{LF}(t) = RLU(\ R_{LF}(F^{upper}(t)), rr_{min}\ ) \times\ P$$

3) Low SP Error: Firstly, measurement errors are calculated, this means that for each sample m, the error is calculated as:

$$e_m = \begin{cases} LB_{LF} - R & R < LB_{LF} \\ 0 & LB_{LF} \le R \le UB_{LF} \\ R - UB_{LF} & R > UB_{LF} \end{cases}$$

To calculate the final Low SP Error, the rolling minimum window is used. As defined in Table 6, for DC:

$$E = \max_m \begin{pmatrix} rolling\_minimum\ es_m \\ over\ 0.2\ seconds \end{pmatrix}$$

For a 20 Hz sampled data of a DC service, the error rolling minimum for Low is calculated using 4 samples as shown from the ***PerfMon_Excel tool.***

	A	AB	AC
1	t	LF_scaled_error	LF_errors rolling
2	0.00	0.000	0.000
3	0.05	0.100	0.000
4	0.10	0.500	0.000
5	0.15	0.300	0.000
6	0.20	0.000	0.000
7	0.25	0.000	0.000

=MIN(AB2:AB5)

Then the maximum value among the calculated rolling errors within the SP defines the Low SP Error.

4) Low SP k factor: After the Low SP Error (E) is calculated, for DC the SP k factor for SP j can be computed as follows.

$$k_j = \begin{cases} 1 & E < A \\ 1 - (E - A)/(B - A) & A \le E \le B \\ 0 & E > B \end{cases}$$

Where $A = 0.03$ and $B = 0.07$.

5) Low SP Availability: Availability is then computed for the SP using the availability flag submitted in the performance files based on the Table 7, e.g. for DC availability.

Availability flag	DC L Availability	DC H Availability
3	1	1
2	0	1
1	1	0
0	0	0

For 20Hz sampled data, a full SP contains 36000 rows of data, as per the ***PerfMon_Excel*** tool.

	A	R	S	T
1	t	availability	H_availability	L_availability
2	0.00	1.000	0	1
3	0.05	1.000	0	1
4	0.10	1.000	0	1
5	0.15	1.000	0	1
6	0.20	1.000	0	1
7	0.25	1.000	0	1

For a Low service, the SP Availability can be calculated as

$$Availability\ = \frac{sum(Low\ Availability)}{36000}$$

Then the Availability factor Fij for SP j is computed as:

$$Fij = \begin{cases} 0 & Availability < 0.999 \\ 1 & otherwise \end{cases}$$

i.e. if a unit has an availability of less than 99.9% then availability factor will be 0 for that settlement period. Otherwise, if the availability is greater than or equal to 99.9% then the availability factor will be 1 for that settlement period.

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Performance Monitoring

Dynamic Service High

1) Contract: In the first stage, contracts are gathered and processed. This defines the services to be monitored.

Example, assume that the following contract is given:

Unit Name	EFA Date	Delivery Start	Delivery End	EFA	Service	Cleared Volume	Clearing Price	Technology Type
DC-UNIT1	01/02/2023	2023-01-31T23:00:00	2023-02-01T03:00:00	1	DCH	10	1	Batteries

2) High service only equations:

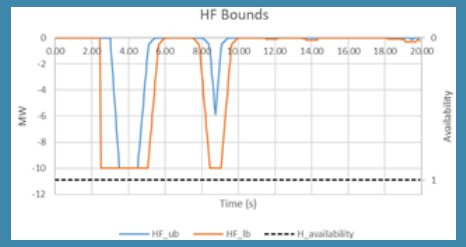

Figure 9: Example of performance bounds for DC High only.

Calculated using the High service equations:

$$UB_{HF}(t) = RLD(\,R_{HF}(F^{lower}(t)), rr_{min}\,) \times Q$$
$$LB_{HF}(t) = RLU(\,R_{HF}(F^{upper}(t)), rr_{min}\,) \times Q$$

3) High SP Error: Firstly, measurement errors are calculated, this means that for each sample m, the error is calculated as:

$$e_m = \begin{cases} LB_{HF} - R & R < LB_{HF} \\ 0 & LB_{HF} \le R \le UB_{HF} \\ R - UB_{HF} & R > UB_{HF} \end{cases}$$

To calculate the final High SP Error, the rolling minimum window is used. As defined in Table 6, for DC:

$$E = \max_m \begin{pmatrix} rolling\_minimum\ es_m \\ over\ 0.2\ seconds \end{pmatrix}$$

For a 20 Hz sampled data of a DC service, the error rolling minimum for High is calculated using 4 samples as shown from the ***PerfMon_Excel*** tool.

	A	Y	Z
1	t	HF_scaled_error	HF_errors rolling
2	0.00	0.100	0.000
3	0.05	0.500	0.050
4	0.10	0.050	0.000
5	0.15	0.220	0.000
6	0.20	0.000	0.000

=MIN(Y2:Y5)

Then the maximum value among the calculated rolling errors within the SP defines the High SP Error.

4) High SP k factor: After the High SP Error (E) is calculated, for DC the SP k factor for SP j can be computed as follows.

$$k_j = \begin{cases} 1 & E < A \\ 1 - (E - A)/(B - A) & A \le E \le B \\ 0 & E > B \end{cases}$$

Where $A = 0.03$ and $B = 0.07$

5) High SP Availability: Availability is then computed for the SP using the availability flag submitted in the performance files based on the Table 7, e.g. for DC availability.

Availability flag	DC L Availability	DC H Availability
3	1	1
2	0	1
1	1	0
0	0	0

For 20Hz sampled data, a full SP contains 36000 rows of data, e.g. using the ***PerfMon_Excel*** tool.

	A	R	S	T
1	t	availability	H_availability	L_availability
2	0.00	1.000	0	1
3	0.05	1.000	0	1
4	0.10	1.000	0	1
5	0.15	1.000	0	1
6	0.20	1.000	0	1
7	0.25	1.000	0	1

For a High service, the SP Availability can be calculated as

$$Availability = \frac{sum(\text{High } Availability)}{36000}$$

Then the Availability factor Fij for SP j is computed as:

$$Fij = \begin{cases} 0 & Availability < 0.999 \\ 1 & otherwise \end{cases}$$

i.e. if a unit has an availability of less than 99.9% then availability factor will be 0 for that settlement period. Otherwise, if the availability is greater than or equal to 99.9% then the availability factor will be 1 for that settlement period.

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Performance Monitoring

Dynamic Service Low and High (1/2)

1) Contract: In the first stage, contracts are gathered and processed. This defines the services to be monitored.

Example, assume that the following contract is given:

Company	Unit Name	EFA Date	Delivery Start	Delivery End	EFA	Service	Cleared Volume	Clearing Price	Technology Type
COMPANY1	DC-UNIT2	01/02/2022	31/01/2022 23:00	01/02/2022 03:00	1	DCL	50	1	NA
COMPANY1	DC-UNIT2	01/02/2022	31/01/2022 23:00	01/02/2022 03:00	1	DCH	50	1	NA

2) Low and High service only equations:

$$UB(t) = ub(t) \times \begin{cases} P & ub(t) \geq 0 \\ Q & ub(t) < 0 \end{cases}$$

$$LB(t) = lb(t) \times \begin{cases} P & lb(t) \geq 0 \\ Q & lb(t) < 0 \end{cases}$$

where

$$ub(t) = RLD(\, R_{sym}(F^{lower}(t)), rr_{min}\,)$$

$$lb(t) = RLU(\, R_{sym}(F^{upper}(t)), rr_{min}\,)$$

For a bundled service (Low and High), an extra step is required to separate the calculations of Low and High errors. This is achieved by segregating the performance bounds into LF and HF as follows:

Performance bounds for LF:

$$UB_{LF}(t) = \begin{cases} UB(t) & UB(t) \geq 0 \\ 0 & otherwise \end{cases}$$

$$LB_{LF}(t) = \begin{cases} LB(t) & LB(t) \geq 0 \\ 0 & otherwise \end{cases}$$

Performance bounds for HF:

$$UB_{HF}(t) = \begin{cases} UB(t) & UB(t) < 0 \\ 0 & otherwise \end{cases}$$

$$LB_{HF}(t) = \begin{cases} LB(t) & LB(t) < 0 \\ 0 & otherwise \end{cases}$$

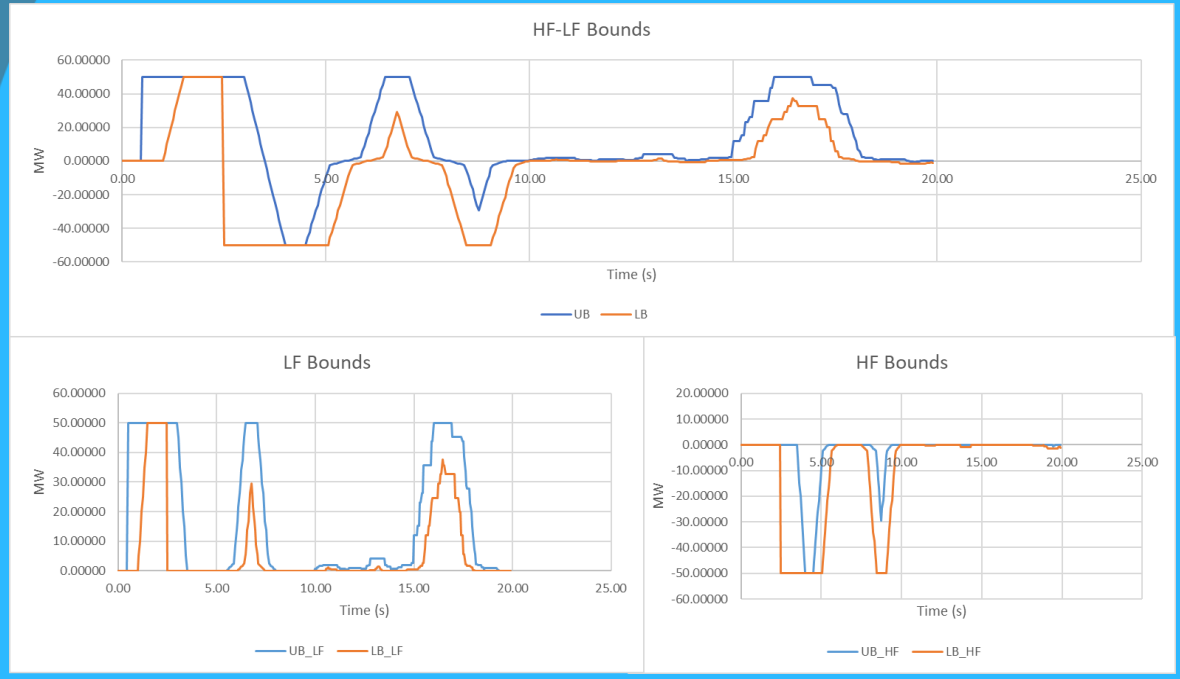

Figure 10: Example of segregated performance bounds for a DC Low and High service.

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Public

Performance Monitoring

Dynamic Service Low and High (2/2)

3) High and Low SP Error. Similarly, the response will be segregated for the calculation of errors, i.e. for response R:

$$R_L = \begin{cases} R & R > 0 \\ 0 & otherwise \end{cases}$$

$$R_H = \begin{cases} R & R < 0 \\ 0 & otherwise \end{cases}$$

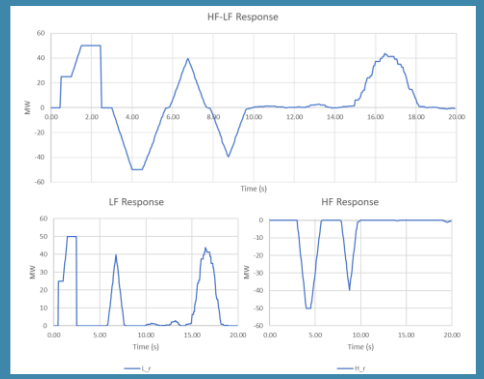

Figure 11: Example of segregated response for DC Low and High service.

Then, measurement errors are calculated for Low and High, this means that for each sample *m*, the measurement errors are defined as:

$$e_{mL} = \begin{cases} LB_{LF} - R_L & R_L < LB_{LF} \\ 0 & LB_{LF} \le R_L \le UB_{LF} \\ R_L - UB_{LF} & R_L > UB_{LF} \end{cases}$$

$$e_{mH} = \begin{cases} LB_{HF} - R_H & R_H < LB_{HF} \\ 0 & LB_{HF} \le R_H \le UB_{HF} \\ R_H - UB_{HF} & R_H > UB_{HF} \end{cases}$$

To calculate the final Low and High SP Error, rolling minimum windows are used. Then the maximum value among the calculated errors within the SP defines the Low and High SP Error separately.

For a DC Low and High contract:

$$E_L = \max_m \begin{pmatrix} rolling\_minimum\ es_{mL} \\ over\ 0.2\ seconds \end{pmatrix}$$

$$E_H = \max_m \begin{pmatrix} rolling\_minimum\ es_{mH} \\ over\ 0.2\ seconds \end{pmatrix}$$

4) Low and High SP k factor: After the SP Errors (E) are calculated, the SP k factors for SP j can be computed for Low and High as follows.

Where $A = 0.03$ and $B = 0.07$.

$$k_{jL} = \begin{cases} 1 & E_L < A \\ 1 - (E_L - A)/(B - A) & A \le E_L \le B \\ 0 & E_L > B \end{cases}$$

$$k_{jH} = \begin{cases} 1 & E_H < A \\ 1 - (E_H - A)/(B - A) & A \le E_H \le B \\ 0 & E_H > B \end{cases}$$

5) Low and High SP Availability: Availability is then computed for the SP using the availability flag submitted in the performance files based on the Table 7, e.g. for DC availability.

Availability flag	DC L Availability	DC H Availability
3	1	1

For 20Hz sampled data, a full SP contains 36000 rows of data, e.g. using the ***PerfMon_Excel*** tool.

	A	R	S	T
1	t	availability	H_availabili	L_availabili
2	0.00	3.000	1.000	1.000
3	0.05	3.000	1.000	1.000
4	0.10	3.000	1.000	1.000
5	0.15	3.000	1.000	1.000
6	0.20	3.000	1.000	1.000
7	0.25	3.000	1.000	1.000
8	0.30	3.000	1.000	1.000

For a High service, the SP Availability can be calculated as:

$$Availability_H = \frac{sum(High\ Availability)}{36000}$$

$$Fij_H = \begin{cases} 0 & Availability_H < 0.999 \\ 1 & otherwise \end{cases}$$

For a Low service:

$$Availability_L = \frac{sum(L\ Availability)}{36000}$$

$$Fij_L = \begin{cases} 0 & Availability_L < 0.999 \\ 1 & otherwise \end{cases}$$

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Performance Monitoring

Arming / Disarming

As per Service Terms, the issue of a Disarming Instruction shall not affect payment of the Availability Payment during the relevant Contracted Service Period(s).

In Performance Monitoring, arming/disarming is monitored through the armed flag in the performance data:

Table 8: Armed / Disarmed Status

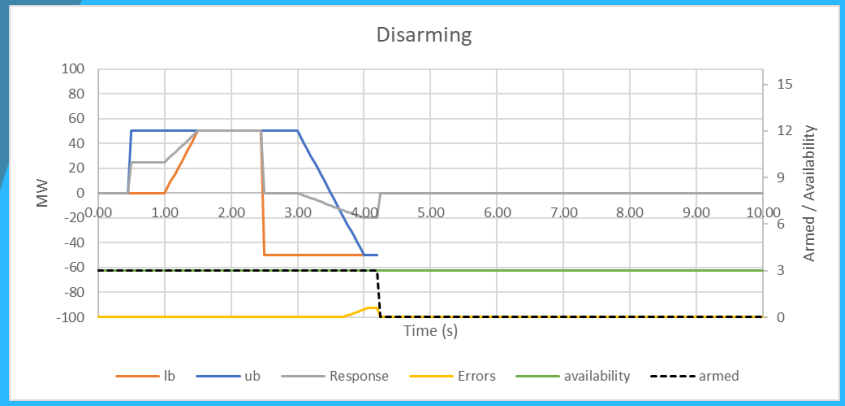
Armed / Disarmed Status

The Armed/Disarmed Status field should be calculated by setting the relevant bits for Armed Services to '1' and leaving the bits for Unarmed Services to '0'

Bit	Service	Armed Bit Value
0	Dynamic Containment, Low Frequency	1
1	Dynamic Containment, High Frequency	2
2	Dynamic Moderation, Low Frequency	4
3	Dynamic Moderation, High Frequency	8
4	Dynamic Regulation, Low Frequency	16
5	Dynamic Regulation, High Frequency	32

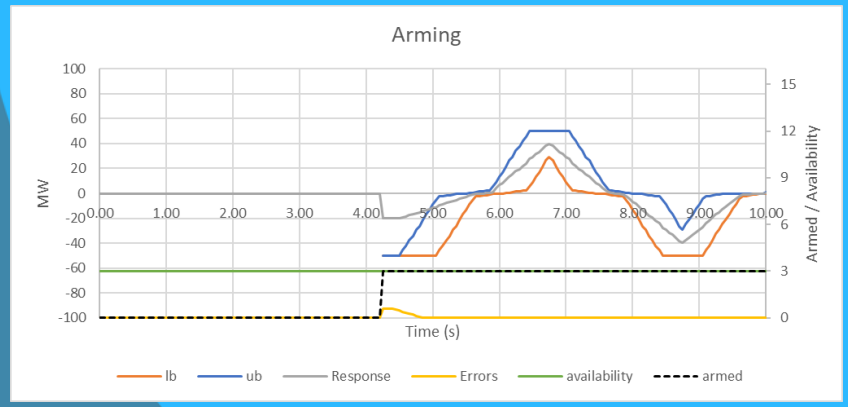
When a unit is disarmed, the flag must indicate the relevant status during the disarmed periods. Performance will not be affected by disarmed periods:

Figure 12: Example for DC Low and High contract



When a unit is re-armed, the flag must indicate the relevant status during the armed periods. The performance bounds will be calculated when the armed status is flagged as active:

Figure 13: Example for DC Low and High contract



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Performance Monitoring

Stacking

- When stacking response services, a single *K*-factor for the asset will be calculated.
- The amount the participant will get paid for each service with the combined *K*-factor will be the same as if they were delivering a single, unstacked service with that same *K*-factor.
- This minimises the risk that a participant may game the penalty when stacking by underperforming on the least valuable service delivering perfectly on the more profitable service.

Example

In this example, we have a single participant providing stacked services: Service 1 and Service 2. The total capacity of the asset is 100 MW, so if the participant clears 100% of its capacity at £1/MW/h it would receive payment of £50 for a settlement period of 30 min.

Table 9: Volume cleared for service 1 & 2

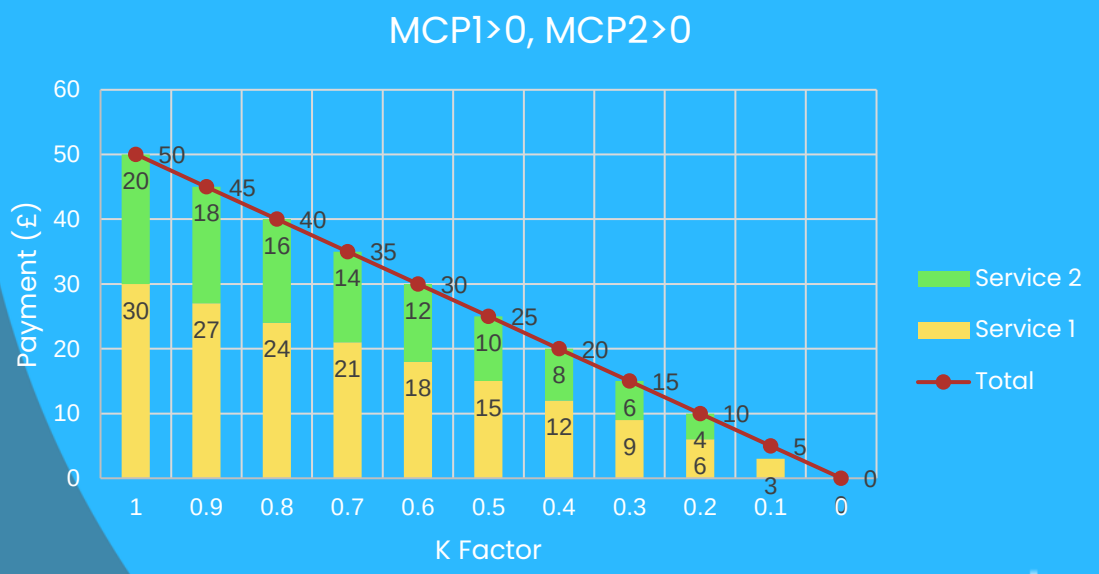
	Volume cleared (MW)
Service 1	60
Service 2	40

The adjacent figures show the total payment vs the K factor (which measures performance against the service envelope) for both services.

Same Clearing Price Example

In this example, the market clearing price (MCP) is the same for both services i.e., £1/MW/h. As the market clearing prices (MCP1 and MCP2) are both greater than zero, then total payment from NESO to the participant decreases as performance decreases. Figure 14 Shows how the total payment is composed by a proportion from Service 1 and another portion for Service 2. Each portion is proportional to the volume cleared for each service and the price at which it was cleared.

Figure 14: Example of penalties for stacked services with MCP1>0 and MCP2>0.



Different Clearing Price Example

If the clearing prices are different, each service is penalised in proportion to its cleared volume and price. For instance, if MCP1>0 but MCP2<0 then penalties from poor performance from Service 1 should reduce the amount that NESO pays the participant whereas penalties from poor performance from Service 2 should increase the amount that the participant pays NESO. Figure 15 shows this case for different K factors. For example, if the market clears at MCP1 = £1/MW/h and MCP2 = -£1/MW/h, and the asset delivers with a K factor of 0.5, payment from NESO to the participant for a single settlement period of each service can be calculated as applying:

$$Payment\_S1 = 60MW*0.5h*(1£/MW/h - (1-0.5)*1£/MW/h) = 15£$$
$$Payment\_S2 = 40MW*0.5h*(-£1/MW/h - (1-0.5)*1£/MW/h) = -30£$$
$$Total\ Payment = Payment\_S1 + Payment\_S2 = 15£ - 30£ = -15£$$

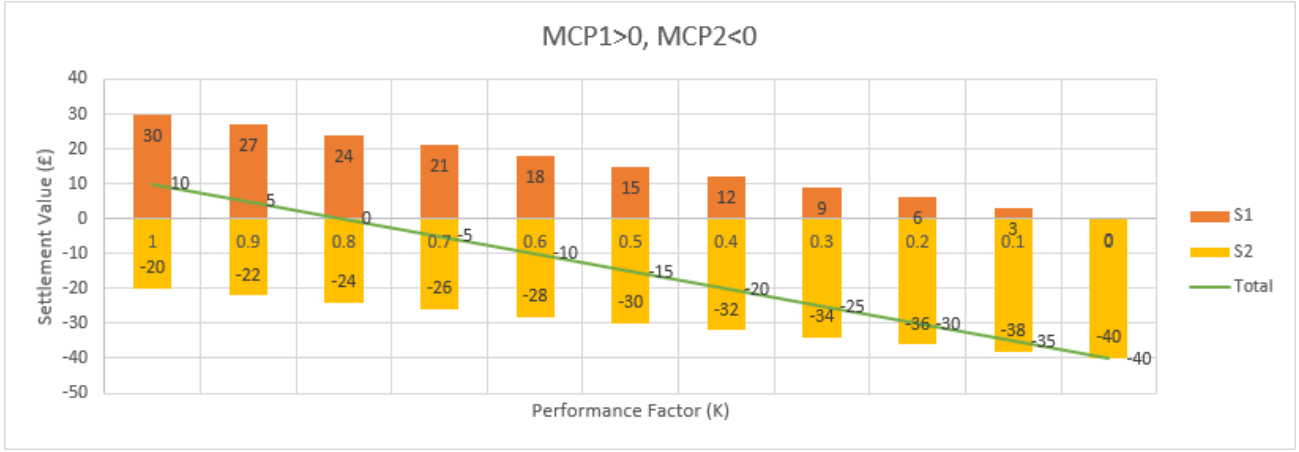


Figure 15: Example of penalties for stacked services with MCP1>0 and MCP2<0.

Consequently, total payment to the participant would be -60£ (participant pays NESO £60).

Monitoring of Bi-Directional Contracts

The purpose of this section is to make you fully aware of our intention going forward, that we will be looking to enhance our monitoring (and hence enforcement) of the contractual terms specific to bi-directional bidding into the Dynamic Containment, Moderation and Regulation services.

This enhanced monitoring will focus on two aspects, in each case in the scenario where, for any Unit, two or more Sell Orders for any of the response services, but in opposite directions (i.e., LF and HF), have been submitted into the auction for the same or overlapping windows, and those Sell Orders have been accepted to result in bi-directional contracts for that asset and period. Those aspects are:

1. The contracted quantities (i.e., MWs contracted in the auctions for those bi-directional contracts), relative to the MW capacity of the Unit delivering the service(s).
2. The residual MW capacity of the Unit remaining, to enable effective State of Energy (SOE) management whilst delivering the contracted service(s).

For these purposes, and as described in the procurement rules , the MW capacity of the Unit is the aggregate registered quantity of each of its component eligible assets.

How NESO will monitor

We will use the data provided, along with published results, to identify any Units post auction that NESO believes could not deliver a bi-directional contract. NESO recognises that whilst Units are tested to their high and low capacities before being allowed to participate in the response auctions, there may be instances when a Unit is simply incapable of delivering these volumes when awarded bi-directional contracts over a single period. As part of the monitoring of bi-directional Sell Orders and contract, where any Unit goes above these suggested thresholds then the participant will be contacted and asked to explain how SOE is being managed.

For example: Dynamic Regulation is a 1-hour service, a Unit with a badged capacity of 10MWhr is tested for 10MW DRL and 10MW DRH. However, when bidding into DR auctions, it must comply with paragraphs 5 and 6 of the Response Services Service Terms, meaning that the combined volume for bi-direction contracts cannot exceed the MW/hr capacity even before SOE management is taken into consideration. Any Units whose aggregate contracted quantities exceed this unit capacity will be deemed unavailable in line with paragraph 5.7 of the Response Services Service terms.

More information available here.

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De-registration of Units

In determining whether to de-register units, due to the apparent seriousness of the potential breach, considerations will include

a. *Whether the non-compliance has caused, is causing, or is likely to cause harm to, competition and the NESO.*

b. *Extent to which business may have benefitted from the non-compliance*

Prior to de-registration of the unit the NGESO will engage with the relevant party to understand the breach where appropriate, warnings will be offered to the participant where necessary before resulting in de-registration of the unit.

Our intent of this power is to prevent the participation of providers for a defined period of time.

Performance Monitoring

Grace Periods

Two types of grace periods can apply when we carry out performance bound calculations. Both cases and relevant examples are described in this guidance.

Grace period 1:

This type of grace period is applied after a response unit begins delivery, after a period of missing data, or after a unit's availability status switches from 'unavailable' to 'available'. The upper and lower performance bounds will be set to P and -Q respectively.

Grace period 2:

This type of grace period is applied after a contract switch within the dynamic suite as well as switching from FFR to the dynamic suite. The contract used for calculations will be the one giving the lowest lower bound, and the highest upper bound. The performance will be assumed to be 100% during such grace period provided that the scaled error is below 25%.

Grace Period 1

Grace period 1 applies:

- At the beginning of delivery
- After a period of missing data
- After switching from 'unavailable' to 'available'

Grace Period 2

Grace period 2 applies:

- When changing between contracts (changes in P or Q)
- After switching between dynamic services
- After switching from FFR contracts to the dynamic service suite

The lengths of the two grace periods are shown below.

Table 10: Grace periods.

Service	Grace period 1 (s)	Grace period 2 (s)
DC	0.55	2
DM	0.55	2
DR	2	10

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Grace Period 1

Beginning of Delivery

Grace period 1 comprises the following cases:

- Beginning of Delivery
- Period of Missing Data
- Switching from Unavailable to Available.

Beginning of Delivery

Beginning of delivery is defined as the start of a dynamic service delivery from any other service not within the dynamic service suite or FFR. For example, if a unit is contracted for a 50MW DC L-only service in EFA 2, EFA 4 and EFA 5, the grace period 1 (for DC, 0.55 seconds grace period) will be applied to the beginning of EFA 2 and EFA 4 only as there are no dynamic service contracts before the beginning of the specified EFAs.

Figure 16: Example of performance bounds without grace period 1 at the beginning of delivery.

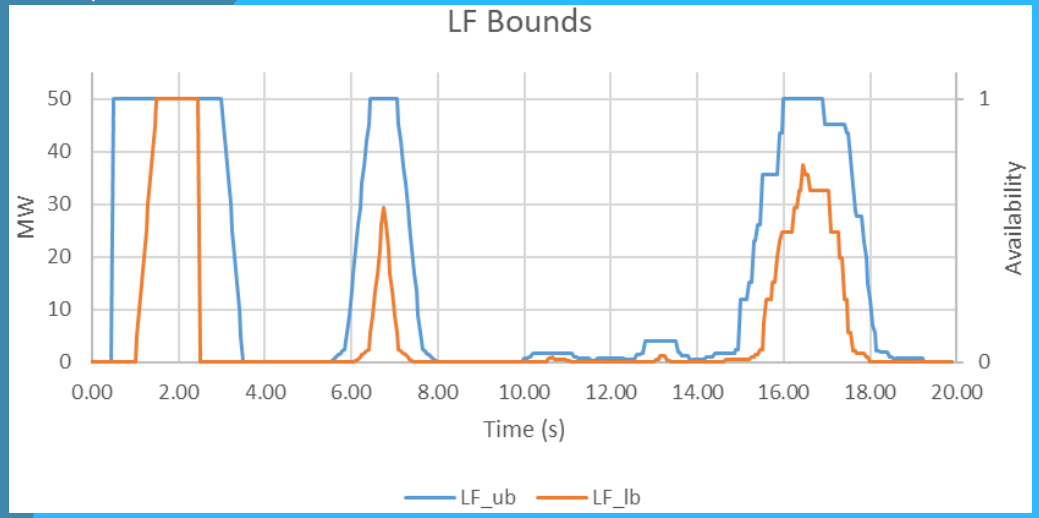
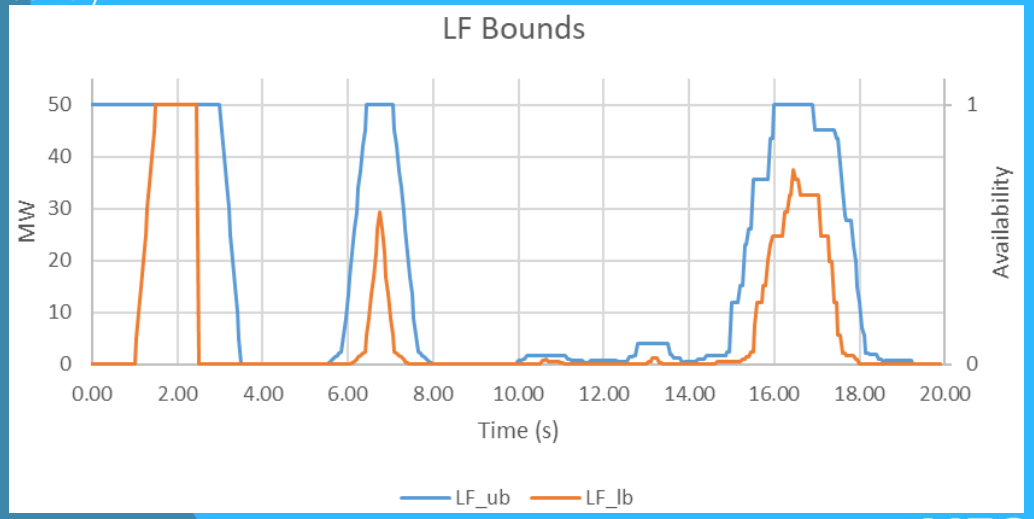


Figure 17: Example of performance bounds without grace period 1 at the beginning of delivery.



Grace Period 1

Missing Data Period

Missing data is defined as gaps in the sampled data, e.g. for 20Hz sampled data, the time intervals will have increments of 50ms for each sample. Then, if the interval is greater than 50ms, the grace period will be applied.

Figure 18: Missing data example

1	t	f_hz
2	0.00	50.00
3	0.05	50.00
4	0.10	50.00
5	1.00	50.00
6	1.05	50.00
7	1.10	50.00
8	1.15	50.00
9	1.20	50.00
10	1.25	50.00
11	1.30	50.00
12	1.35	49.50
13	1.40	49.50
14	1.45	49.50
15	1.50	49.50

Grace period

Grace Period 1

Availability Switch

When a unit switches from unavailable to available the Grace period 1 will be implemented. This applies within every service of the dynamic suite.

The following combinations have been provided as an example for DC. This approach is also applicable to DM and DR in the same way using the respective availability flags for each service.

Table 11: Availability changes for DC service

Availability flag change for DC L-only			
Contracted	from	to	Grace period
DC L-only	0	1	TRUE
DC L-only	0	2	FALSE
DC L-only	0	3	TRUE
DC L-only	1	2	FALSE
DC L-only	1	3	FALSE
DC L-only	2	1	TRUE
DC L-only	2	3	TRUE

Table 12: Availability changes for DC Low and High service

Availability flag change for DC L and H			
Contracted	from	to	Grace period
DC L and H	0	1	TRUE
DC L and H	0	2	TRUE
DC L and H	0	3	TRUE
DC L and H	1	2	TRUE
DC L and H	1	3	TRUE
DC L and H	2	1	TRUE
DC L and H	2	3	TRUE

Table 13: Availability changes for DC High service

Availability flag change DC H-only			
Contracted	from	to	Grace period
DC H-only	0	1	FALSE
DC H-only	0	2	TRUE
DC H-only	0	3	TRUE
DC H-only	1	2	TRUE
DC H-only	1	3	TRUE
DC H-only	2	1	FALSE
DC H-only	2	3	FALSE

Grace Period 1 – Availability Switch

The following combinations have been provided as an example for DC.

This approach is also applicable to DM and DR in the same way using the respective availability flags for each service.

Figure 19: Example of availability changes for DC L

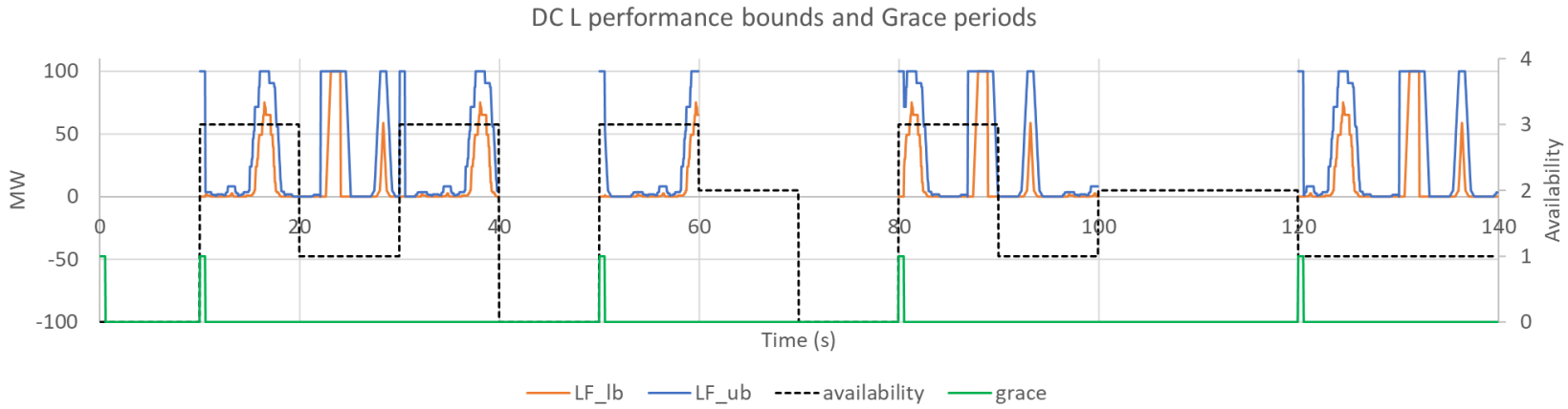
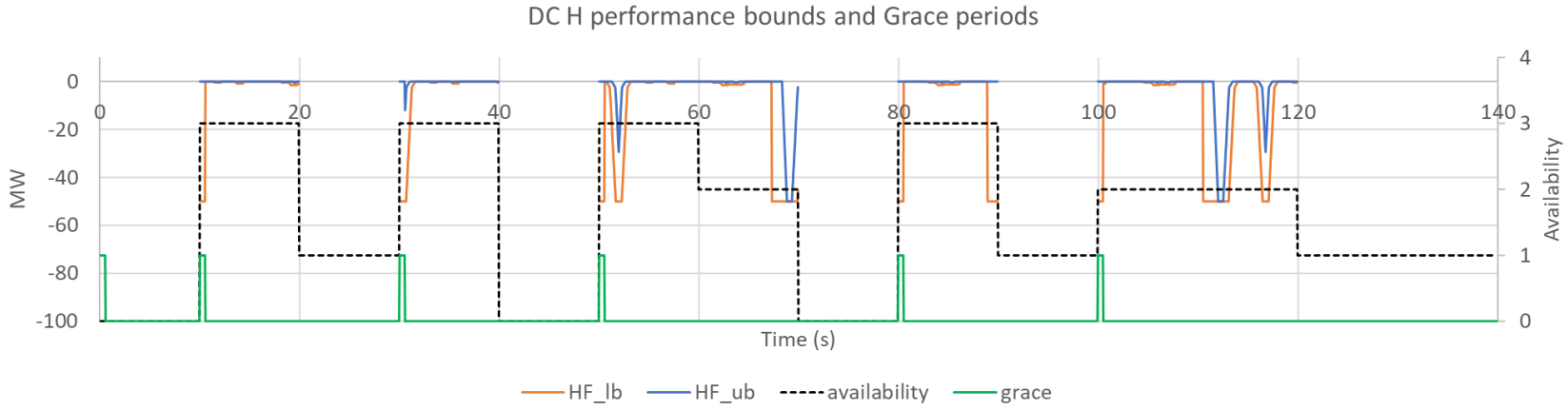


Figure 20: Example of availability changes for DC H



Grace Period 2

Grace period 2 is applicable after a contract switch within the dynamic suite (also when switching from FFR to the dynamic suite) using whichever of the contracts gives the lowest lower bound, and the higher upper bound.

A non–exhaustive list of scenarios where grace period 2 will be applicable is given here.

DR switches (10 seconds grace period)

- DRL to DRH/DRLH
- DRH to DRL/DRLH
- DRL to DRL (if there is a change in P)
- DRH to DRH (if there is a change in Q)
- FFR to DR
- DC/DM to DR

DC switches (2 seconds grace period)

- DCL to DCH/DCLH
- DCH to DCL/DCLH
- DCL to DCL (if there is a change in P)
- DCH to DCH (if there is a change in Q)
- FFR to DC
- DM/DR to DC

DM switches (2 seconds grace period)

- DML to DMH/DMLH
- DMH to DML/DMLH
- DML to DML (if there is a change in P)
- DMH to DMH (if there is a change in Q)
- FFR to DM
- DC/DR to DM

Grace Period 2

This type of grace period is applied after a contract switch within the dynamic suite as well as switching from FFR to the dynamic suite.

This change will provide the corresponding grace period where the Upper performance bound and the Lower performance bound will be calculated using whichever of the contracts gives the lowest lower bound (LB), and the highest upper bound (UB). The performance will be assumed to be 100% during such grace period provided that the scaled error is below 25%.

This can be defined as follows, for two consecutive DC L-only contracts EFA 1 with P_1 switch to EFA 2 with P_2 :

$$UB_1(t) = RLD\left(R_{LF}\left(F^{lower}(t)\right), rr_{min}\right) \times P_1$$

$$LB_1(t) = RLU(R_{LF}(F^{upper}(t)), rr_{min}) \times P_1$$

and

$$UB_2(t) = RLD\left(R_{LF}\left(F^{lower}(t)\right), rr_{min}\right) \times P_2$$

$$LB_2(t) = RLU(R_{LF}(F^{upper}(t)), rr_{min}) \times P_2$$

Then LB and UB are calculated for 2 second after the change, i.e. at the beginning of EFA 2, as:

$$UB_{LF}(t) = max(UB_1(t), UB_2(t))$$

$$LB_{LF}(t) = min\left(LB_1(t), LB_2(t)\right)$$

The scaled error will then be calculated as:

$$e_m = \begin{cases} LB_{LF} - R & R < LB_{LF} \\ 0 & LB_{LF} \le R \le UB_{LF} \\ R - UB_{LF} & R > UB_{LF} \end{cases}$$

$$es_m = \begin{cases} \frac{e_m}{P_2} - 0.25 & \frac{e_m}{P_2} > 0.25 \\ 0 & \frac{e_m}{P_2} \le 0.25 \end{cases}$$

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Energy Requirement and Duration

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

a classification given in the Registration and Pre-Qualification Procedure to any Auction 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
(b) whose State of Energy at the start of a relevant Service Period is insufficient to provide full delivery of the Contracted Quantity for the duration of that Service Period;

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

The rules are required to give NESO assurance that energy limited assets can reliably provide the full contracted quantity of dynamic services. 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 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. fifteen (15) minutes (DC)
   b. sixty (60) minutes (DR)
   c. thirty (30) minutes (DM)
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.

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Operational Baselines

Physical Notifications

Physical Notifications (PNs) are used as the accepted Operational Baseline to state what a units expected profile will be for an upcoming Settlement Period.

Response Units that are also registered in the BM are required to submit an operational baseline in the form of a physical notification to the BM System. From Release 1 go-live, Response Units that are not registered in the BM will be required to submit an operatonal baseline in the same way but into the ASDP System.

Settlement Period: A 30-minute period starting either on the hour or half hour which is the resolution at which payments are settled

Gate Closure: The time 60 minutes prior to the start of the Settlement Period. After this time the PN can no longer be submitted or changed for the applicable Settlement Period. This is to allow NESO time to balance the market without further changes.

Example:

If the settlement period is 14:00-14:30, then Gate Closure is 13:00

PN Formatting

A PN takes the form of a CSV file which is entered into the BM or ASDP system using the following format:

BMU_ID, **Start datetime**, **End Datetime**, **Start MW**, **End MW**

The **BMU_ID** is assigned to a unit via the registration process at the start of an assets life

The **datetime** must be in GMT all year and must have at lowest 1 minute resolution

For BM, **MW** values must be declared as integers

Using this data the system can build a graphical profile (baseline) of what each unit will be doing. A PN does not need to be a static value, it can change over the duration of the Settlement Period.

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State of Energy Management

The State of Energy Management (SoE) rules and requirements are set to ensure that energy-limited units remain able to provide the contracted services on a continuous basis. The rules are applicable for BM and NBM units.

The current SoE monitoring practices allow us to identify the situations where a unit is allowed to declare unavailability due to excessive delivery of response services. This situation could arise if the unit follows the SoE rules in full and runs out of SoE. SoE monitoring also allows us to monitor that units follow the management rules during such situations, where an unavailability is treated as available in terms of payement.

General SoE management guidelines

SoE management for DC/DM/DR should rely on energy-limited units:

1. Reserved volume when submitting sell orders to allow for adequate head/foot room.
2. Beginning the EFA Block with a level of stored energy adequate for their contracted response quantity.
3. Reviewing 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.
4. Aim to return the stored energy to an appropriate level by following the submitted operational baselines, charging or discharging according to them.

More information and detailed examples can be found in our SoE methodology.

Instruction Codes

Instruction and Reason Codes

Reason codes are issued for BMUs. ASDP sends instructions for Non-BMUs.

These are used to send instructions to providers in real time. The DNS 'disarming' code as now been retired. in its place are a suite of disarming codes so that individual services can be disarmed separately.

Rearming is also instructed using service-specific codes such as DCL for Dynamic Containment Low Response services.

Codes in use for BM units

Table 15: List of Re-arming Reason Codes

Re-arm Codes	
DCL	Dynamic Containment Low Response
DCH	Dynamic Containment High Response
DML	Dynamic Moderation Low Response
DMH	Dynamic Moderation High Response
DRL	Dynamic Regulation Low Response
DRH	Dynamic Regulation High Response

Table 16: List of Disarming Reason Codes

Dis-arm Codes	
XCL	Dynamic Containment Low Response
XCH	Dynamic Containment High Response
XML	Dynamic Moderation Low Response
XMH	Dynamic Moderation High Response
XRL	Dynamic Regulation Low Response
XRH	Dynamic Regulation High Response

Reason Codes Examples

Example 1: Simple disarm / re-arm
Unit A is armed and currently contracted to provide DCH
Unit A is sent instruction with the reason code XCH (disarm DCH)
⇨ Unit A accepts the instruction and is disarmed, ceasing to provide DCH
While Unit A is contracted, Unit A is sent an instruction with the reason code DCH (re-arm DCH)
⇨ Unit A accepts the instruction, is re-armed and resumes its DCH service.

Example 2: Stacking disarm/re-arm
Unit C is armed and currently contracted to provide DCH and DRL
Unit C is sent an instruction with the reason code XRL (disarm DRL)
⇨ Unit C accepts the instruction, is disarmed for DRL and ceases to provide DRL. However, it remains armed for DCH and continues to provide DCH
While Unit C is contracted, Unit C is sent an instruction with the reason code DRL (re-arm DRL)
⇨ Unit C accepts the instruction, is re-armed for DRL and resumes its DRL service. There is no change in the DCH service.

Operational Data

System Notifications

Availability Service Inbound

This section provides guidelines for submitting availability data. Frequency Response Ancillary Services (Dynamic Moderation (High/Low), Dynamic Containment (High/Low) and Dynamic Regulation (High/Low)) can submit the availabilities using the OfferBid array for a particular Availability Window or a group of Windows as required. In the event of any conflict or inconsistency between this document and the Service Terms, the latter shall prevail.

Further details and guidance on availability can be found here.

Guidelines:

1. Service Providers should invoke the Availability webservice to submit any declarations or redeclarations for all Ancillary Services.
2. Service Providers can send availabilities for multiple windows using a single xml, multiple OfferBid arrays in a single AvailabilityWindow where applicable.
3. Service Providers would invoke the Webservice as per the WSDL url: https://test.pas.nationalgrid.com/services/V3_Sandbox_ConsumeAvailabilityService?wsdl and sample payloads in Appendix 1A.
4. NESO will Accept/Reject the availability (through Availability Confirmation web service 3.2) for a specific availability window as specified in business logic document
5. AUI should have 15-18 characters in total with the following algorithm to make it unique to 1 in million times. This field is used for traceability purposes. See example payloads in Appendix for reference.

a) First 3 characters will have 'AUI'

b) Next 2 characters will be random lowercase alphabets from a-z

c) Next characters will be a random number from 1 to 9999

d) Next 3 characters will be random uppercase alphabets between A-Z

e) The last 6 characters will be MMHHdd (where MM is month e.g. 08; HH is hours e.g. 16; dd is date e.g. 28) So, an example AUI will be 'AUIxq34YMU081816'

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Data and Transparency

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

Details on how to connect to these platforms and further technical detail can be found on the Dynamic Service 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.

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

Settlements

Settlements

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

NESO shall apply DC/DM/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 NESO's systems. These should be submitted as soon as possible so that we make payments in a timely manner in accordance with the Service Terms.

Energy services procured
The ESO enters into a contract with providers either via bilateral agreements, or via a tender process

Service utilised
When a service is utilised (i.e. a generator releases energy into the network), the relevant provider needs to get paid for that service.

Service settled
Settlements team calculate how much the provider needs to get paid for their services and instruct Finance to release payment.

Costs recovered
The Revenue team then calculates how much the ESO has spent in services, spreads that cost across the industry (generators, suppliers, etc.) and instruct Finance to recover that cost.

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Figure 22: Provider Journey

Settlements Process

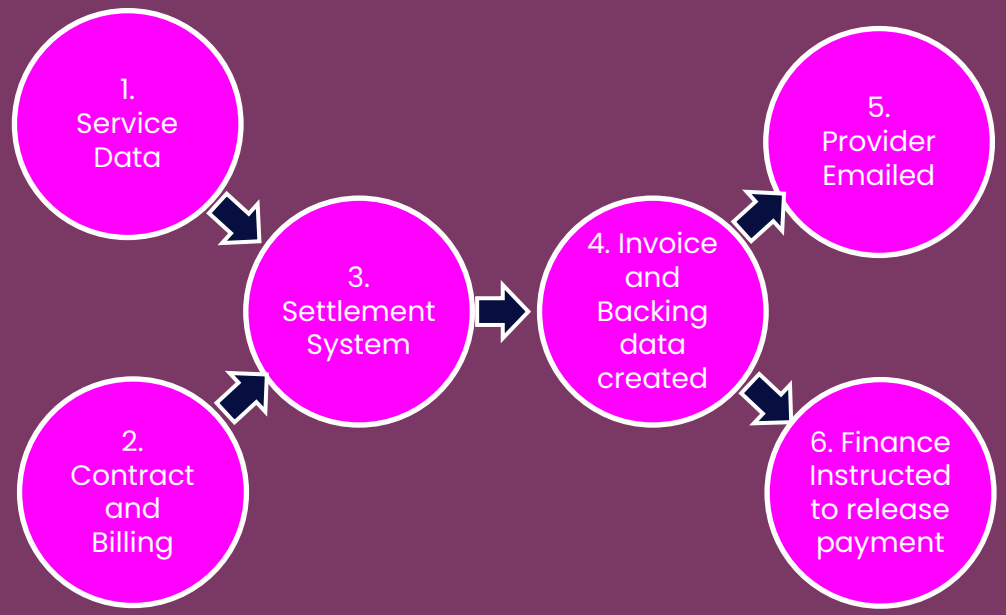

Figure 23: Flow through of settlements process

1. Service Data – This is operational data relating to the provision of a service and is used to calculate monies owed, e.g. metering data, contracted MW, etc.
2. Contact and billing data – This is customer and company contact information, such as email recipients, billing addresses, etc.. If you are setting up as a new service provider, please refer to the New Service Provider Guidance document.
3. Settlements system – Service, contact and billing data is collated in the Settlements system where calculations for monies owed takes place.
4. Invoices and backing data produced – This information is produced at D+8 (preliminary) and D+18 (final). Please note that the preliminary billing process does not include the creation of invoices or the instruction of payments to the Finance team.
5. Provider emailed - Invoice and backing data is email to the provider.
6. Finance instructed to release payment - Finance are instructed to release payment to the provider.

Interactions with other markets

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 Containment, Dynamic Moderation and Dynamic Regulation will be treated as a "Relevant Balancing Service" for the purpose of the Capacity Market Rules, and accordingly delivery of Dynamic Containment, Dynamic Moderation and 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).

Balancing Mechanism

The supporting guidance on stacking the dynamic services with the balancing mechanism and BOAs has been updated, this guidance can be found here.

Distribution Networks

Active Network Management Zones

Eligible Assets will not normally be registered by NESO for participation in DC/DM/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, NESO 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). NESO shall continue to keep this under review and any changes to this position shall be consulted accordingly.

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Splitting

Splitting within response

- Splitting is allowed between all frequency response products (i.e., amongst any combination of DCL, DCH, DML, DMH, DRL, and DRH).

Splitting within reserve

- Splitting is allowed between Balancing Reserve product (PBR and NBR), between Quick Reserve product (PQR and NQR), and between Slow Reserve products (PSR and NSR).
- Splitting is not allowed between different reserve services.

Splitting between response and reserve

- Splitting is allowed between Balancing Reserve product and response product in the opposite direction (i.e., PBR and DCH/DMH/DRH, NBR and DCL/DML/DRL).

Splitting Matrix			Response						Reserve					
			DC		DM		DR		BR		QR		SR	
			DCL	DCH	DML	DMH	DRL	DRH	PBR	NBR	PQR	NQR	PSR	NSR
Response	DC	DCL												
		DCH												
	DM	DML												
		DMH												
	DR	DRL												
		DRH												
Reserve	BR	PBR												
		NBR												
	QR	PQR												
		NQR												
	SR	PSR												
		NSR												

Splitting not allowed | Splitting allowed | Not Applicable

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Appendices

Appendix A – Table of Acronyms (1)

Acronyms	Full Meaning	Acronyms	Full Meaning
ANM	Active Network Management	DCH	Dynamic Containment High
ABSVD	Applicable Balancing Services Volume Data	DCL	Dynamic Containment Low
API	Application Program Interface	DCLH	Dynamic Containment Low and High
ASDP	Ancillary Services Dispatch Platform	DFFR	Dynamic Firm Frequency Response
BMU	Balancing Mechanism Unit	DFR	Dynamic Frequency Response
BM	Balancing Mechanism	DM	Dynamic Moderation
BOA	Bid-Offer Acceptance	DMH	Dynamic Moderation High
BOD	Bid-Offer Data	DML	Dynamic Moderation Low
CM	Capacity Market	DMLH	Dynamic Moderation Low and High
CMU	Capacity Market Unit	DR	Dynamic Regulation
CSV	Comma-Separated Values	DRH	Dynamic Regulation High
DEP	Digital Engagement Platform	DRL	Dynamic Regulation Low
DNS	Domain Name Server	EBGL	European Balancing Guideline
DNO	Distribution Network Operator	EFA	Electricity Forward Agreement
DC	Dynamic Containment	ESO	Electricity System Operator
DC-HF	Dynamic Containment - High Frequency	EAC	Enduring Auction Capability
DC-LF	Dynamic Containment - Low Frequency	EDL	Electronic Dispatch Logger

Appendix A – Table of Acronyms (2)

Acronyms	Full Meaning	Acronyms	Full Meaning
EDT	Electronic Data Transfer	NDZ	Notice to Deviate from Zero
EFA	Electricity Forward Agreement	NTB	Notice to Deliver Bids
FY	Financial Year	NTO	Notice to Deliver Offers
FFR	Firm Frequency Response	Ofgem	Office of Gas and Electricity Markets
GSP	Grid Supply Point	OBP	Open Balancing Programme
Hz	Hertz	OB	Operational Baseline
HF	High Frequency	PerfMon	Performance Monitoring
LF	Low Frequency	PN	Physical Notification
LB	Lower Bound	RDR	Run-Down Rate
MCP	Market Clearing Price	RUR	Run-Up Rate
MEL	Maximum Export Limit	STAR	Settlements and Revenue
MW	Megawatt	SP	Settlement Period
MW/min	Megawatt per minute	SMP	Single Markets Platform
MWh	Megawatt-hour	SEL	Stable Export Limit
MIL	Minimum Import Limit	SIL	Stable Import Limit
MBSS	Monthly Balancing Services Statements	SOE	State of Energy
NESO	National Energy System Operator	2FA	Two-Factor Authentication
NBM	Non-Balancing Mechanism	UB	Upper Bound

Continuing the conversation

Email us with your views on this guidance document or our Dynamic Response Services at:

Box.futureofbalancingservices@nationalenergyso.com

And one of our team members will get in touch

Access our current Response documents here:

Dynamic Response

Mandatory Frequency Response

Firm Frequency Response

Connect with us on social media:

X

LinkedIn

YouTube

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