Dynamic Containment Service Terms

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Introduction

1.1 These DC Service Terms shall apply to each Service Provider and Response Unit the subject of a DC Response Contract where, in accordance with the DC Auction Rules, and for any EFA Block and DC Product, the Service Provider’s DC Sell Order for that Response Unit is accepted by NGESO.

1.2 Each DC Response Contract shall be governed by these DC Service Terms, and shall comprise a legally binding contract between NGESO and the Service Provider.

Changes to these DC Service Terms

2.1 Subject always to paragraph 2.2, NGESO may update these DC Service Terms from time to time by publication of an updated version on its website, and each such updated version shall be effective from the date shown on its front cover provided always that any updated version shall not apply to any DC Response Contract extant at the date of publication except with the consent in writing of the relevant Service Provider.

2.2 To the extent required by the Electricity Balancing Guidelines (and by reference to those provisions of the DC Procurement Documents constituting terms and conditions approved by the Authority as the terms and conditions related to balancing pursuant to Article 18 of the Electricity Balancing Guidelines), any variation to these DC Service Terms will be proposed and implemented in accordance with the applicable requirements in the Electricity Balancing Guidelines.

DC General Terms and Conditions and DC Glossary of Terms and Rules of Interpretation

3.1 These DC Service Terms are subject to the prevailing DC General Terms and Conditions published by NGESO alongside these DC Service Terms.

3.2 Unless the context otherwise requires, any capitalised term used in these DC Service Terms shall have the meaning given to it (if any) in the prevailing DC Glossary of Terms and Rules of Interpretation, and the rules of interpretation set out in that document shall also apply.

3.3 For the purposes of paragraphs 3.1 and 3.2, with respect to any DC Response Contract, “prevailing” shall mean the latest version of the applicable document which is in effect at the Auction Closing Time associated with that DC Response Contract.

DC Response Contracts

4.1 Each DC Response Contract shall be automatically formed in accordance with the DC Auction Rules.

4.2 A DC Response Contract shall relate to a single Response Unit, and shall apply only to a single EFA Block and DC Product.

4.3 An EFA Block the subject of a DC Response Contract is referred to in these DC Service Terms as a “Contracted EFA Block”.

4.4 Each DC Response Contract so formed shall create a legally binding obligation on the Service Provider to provide from the relevant Response Unit, and for NGESO to pay for, Dynamic Containment (comprising a single DC Product) to be delivered during the relevant Contracted EFA Block upon the terms of these DC Service Terms. For the avoidance of doubt, neither a Service Provider nor NGESO shall be under any obligation or commitment to provide or pay for Dynamic Containment except pursuant to DC Response Contracts.

4.5 Neither Party may terminate a DC Response Contract once formed except as provided or referred to in paragraph 14 or by agreement in writing between the Parties.

Service Availability

5.1 The Service Provider (or, where applicable, the Secondary Service Provider, and references in this paragraph 5 to “Service Provider” shall be construed accordingly) will procure that, with respect to each DC Response Contract, Response is made available from the Response Unit for delivery throughout each Contracted EFA Block in the manner provided in paragraph 6. It is a requirement of each DC Response Contract that, unless prevented by an unplanned outage or other unforeseen technical circumstances, a Response Unit will be available to provide Dynamic Containment in accordance with these DC Service Terms continuously throughout the Contracted EFA Block, regardless of its State of Energy where applicable.
5.2 The Service Provider shall notify NGESO (by way of submission of DC Operational Data or (only if directed by NGESO) by way of submission of DC Performance Data, pursuant to paragraph 15.1) promptly upon becoming aware that any Response Unit (including any component Eligible Asset) has become unable (including, where it is Energy Limited, because of its State of Energy) to provide (in whole or part), and at any time during the relevant Contracted EFA Block, the Contracted Quantity or Response Energy Volume or any other requirement of Dynamic Containment in accordance with these DC Service Terms.

5.3 The submission of DC Operational Data (or, where applicable, DC Performance Data) pursuant to paragraph 15.1 shall also be used by the Service Provider to notify NGESO promptly when it becomes aware that, following notification pursuant to paragraph 5.2, the ability of a Response Unit to meet the requirements of Dynamic Containment in accordance with these DC Service Terms has been restored.

5.4 Upon request by NGESO, any notification pursuant to paragraph 5.2 or 5.3 shall be followed promptly by an explanation in sufficient (but not excessive) detail to enable NGESO to verify that the Service Provider’s notification related to unplanned outage or other unforeseen technical circumstances).

5.5 Except as provided in paragraph 5.6, with effect from the start of the Settlement Period in which the Response Unit becomes unable to meet the requirements of the relevant DC Product (whether or not notified by the Service Provider pursuant to paragraph 5.2) and until expiry of the Settlement Period in which the ability of a Response Unit to meet the requirements of such DC Product is restored (or, if later, the time when the Service Provider notifies NGESO that is has been restored), the Response Unit shall, for the purposes of paragraph 7, be deemed to be unavailable to deliver Dynamic Containment.

5.6 A Response Unit which would otherwise be considered unavailable due to its State of Energy will be deemed available if the Service Provider has complied with the State of Energy management rules in accordance with paragraph 6.11 and no further such management is possible.

5.7 Where either:-

i. in the absence of notification from the Service Provider pursuant to paragraph 5.2, NGESO nonetheless has reasonable grounds for believing that a Response Unit is unable to meet the requirements of the DC Response Contract in all or any part of a Contracted EFA Block; or

ii. NGESO has reasonable grounds for believing that any notification from the Service Provider pursuant to paragraph 5.2 is for reasons other than related to an unplanned outage or other unforeseen technical circumstances and/or that the Service Provider has deliberately or recklessly failed to comply with the State of Energy management rules in accordance with paragraph 6.11,

then, notwithstanding paragraph 5.4 and for the purposes of paragraph 7, NGESO reserves the right to treat that Response Unit as deemed unavailable to deliver Dynamic Containment for the entirety of the Contracted EFA Block in question (including any part thereof prior to the commencement of unavailability).

5.8 For the avoidance of doubt, with respect to any Transfer Period and for the purposes of this paragraph 5 and paragraph 7, all and any periods of unavailability of the applicable Response Unit(s) Registered to the Secondary Service Provider shall be treated as deemed unavailability of the Response Unit.

5.9 Further for the avoidance of doubt, the registration of Eligible Assets to a Response Unit may not be changed so as to be effective during the subsistence of a DC Response Contract.

6. Service Delivery

6.1 Throughout each Contracted EFA Block, and except to the extent the Response Unit is deemed to be unavailable to deliver Dynamic Containment pursuant to paragraph 5, the Service Provider (or, where applicable, the Secondary Service Provider, and references in this paragraph 6 to “Service Provider” shall be construed accordingly) shall procure the delivery of Response in accordance with this paragraph 6.

6.2 In relation to each Settlement Period falling in each Contracted EFA Block, the Service Provider shall notify NGESO of an intended operating profile (being a level (which may be zero) of Output or Demand) for the Response Unit (which, where applicable, shall be an aggregate operating profile across all Eligible Assets) (the “Operational Baseline”), together with confirmation of the technical and commercial parameters comprising each DC Response Contract, in accordance with either paragraph 6.3 or 6.4 (as applicable), and in relation thereto:-
i. each Operational Baseline shall be prepared by the Service Provider in accordance with Good Industry Practice so as to reflect for the relevant Response Unit the Service Provider’s best estimate of the operating profile of the Response Unit in the relevant Settlement Period;

ii. each Operational Baseline may be either an integer or a value with up to four (4) decimal places; and

iii. where the Response Unit is Energy Limited the Service Provider shall comply with the State of Energy management rules in paragraph 6.11.

6.3 Where the Response Unit is BM Participating, the Service Provider shall confirm its Operational Baseline to NGESO by submission of a Physical Notification in accordance with the Grid Code (where applicable, rounding up or down to the nearest integer), and shall maintain that Physical Notification as at Gate Closure (with any subsequent Bid-Offer Acceptance adjusting the Operational Baseline accordingly), and the Service Provider shall further maintain appropriate Dynamic Parameters throughout each relevant Contracted EFA Block to create sufficient headroom and/or footroom for delivery of the Contracted Quantity.

6.4 NGESO shall notify Registered DC Participants in writing of the date when it is able to receive Operational Baselines in respect of Response Units which are not BM Participating, and with effect from such date and in relation to each such Response Unit, the Service Provider shall confirm its Operational Baseline to NGESO by submission, no later than sixty (60) minutes prior to the start of each relevant Settlement Period, of a Non-BM Data Submission (in such format as NGESO shall specify in the DC Participation Guidance Document) comprising, for that Settlement Period:-

i. the Response Unit ID;

ii. confirmation of its Operational Baseline;

iii. a maximum export level or minimum import level which equals the Operational Baseline plus the Contracted Quantity; and

iv. a minimum export level or maximum import level which equals the Operational Baseline minus the Contracted Quantity,

which shall be submitted by the Service Provider by way of DC Operational Data or (only if directed by NGESO) by way of Performance Data, pursuant to paragraph 15.1.

6.5 Where, in respect of any Settlement Period in a Contracted EFA Block, the Service Provider has failed to prepare and submit an Operational Baseline for the relevant Response Unit in accordance with paragraph 6.2 and (as applicable) paragraphs 6.3 or 6.4, then for the purposes of paragraphs 5 and 7 that Response Unit shall be deemed to be unavailable to deliver Dynamic Containment for the entirety of that Settlement Period.

6.6 Unless otherwise instructed by NGESO, for the duration of each Contracted EFA Block, the Service Provider shall operate the Response Unit (where applicable at the Operational Baseline and with a State of Energy) so as to provide, for any Frequency Deviation, at least the amount of Response shown in the capability data tables at Schedule 1 to these DC Service Terms (being expressed as a percentage of the Contracted Quantity) and for a continuous period not less than the Delivery Duration.

6.7 For the purposes of paragraph 6.6:-

i. Response is not required for Frequency Deviations + 0.015 Hz (in the case of DC-high) or – 0.015 Hz (in the case of DC-low) in each case from Target Frequency, and from that dead band to + 0.2 Hz (in the case of DC-high) or – 0.2 Hz (in the case of DC-low) the required level of Response shall be either:-

1. in the case of DC-high, a linear increase to a maximum of five percent (5%) of Contracted Quantity at + 0.2 Hz, and from that point the required level of Response shall be a linear increase to one hundred percent (100%) of Contracted Quantity at + 0.5 Hz; and
2. in the case of DC-low, a linear increase to a maximum of five percent (5%) of **Contracted Quantity** at –0.2 Hz, and from that point the required level of **Response** shall be a linear increase to one hundred percent (100%) of **Contracted Quantity** at – 0.5 Hz;

ii. the required levels of **Response** in the tables are shown as a percentage of the **Contracted Quantity**;

iii. for a **Frequency Deviation** at a given time differing from the figures shown in the tables, the required levels of **Response** shall be calculated by linear interpolation from the values derived from the table;

iv. for any **Frequency Deviation** greater than the greatest **Frequency Deviation** given in the tables (whether positive or negative), the required levels of **Response** shall be calculated by reference to the greatest **Frequency Deviation** shown (whether positive or negative); and

v. required levels of **Response** for **Frequency Deviations** lower than those specified in the tables shall be determined by deeming the tables to specify a level of zero (0) MW for a **Frequency Deviation** of zero (0).

**Response Units which are Energy Limited**

### 6.8

Throughout each **Contracted EFA Block** and additionally during each **Settlement Period** falling immediately prior to and after that **Contracted EFA Block**, for any **Response Unit** which is **Energy Limited** the **Service Provider** shall procure that its **Operational Baselines** at all times observe the **Maximum Ramp Rate**. Any failure to do so in relation to any **Settlement Period** will deem the **Response Unit** to be unavailable to deliver **Dynamic Containment** for the entirety of that **Settlement Period** for the purposes of paragraphs 5 and 7.

### 6.9

For the purposes of paragraph 6.8:-

i. as more particularly described in the **DC Participation Guidance Document**, the **Maximum Ramp Rate** shall be calculated by reference to whether the **Response Unit** is providing DC-low, DC-high or both, and whether its **Operational Baseline** is showing either an increase or reduction in level of **Active Power Output** or an increase or reduction in level of **Demand**;

ii. where there are two adjacent **Contracted EFA Blocks** with different **Contracted Quantities**, for two (2) adjacent **Settlement Periods** on the boundary of a change in **Contracted Quantity**, the relevant **Maximum Ramp Rate** will be that which incorporates the lowest maximum rate; and

iii. for the avoidance of doubt, where a **Response Unit** is BM Participating its **Operational Baseline** shall be adjusted by a **Bid-Offer Acceptance**, and accordingly to the extent complying with any such **Bid-Offer Acceptance** the **Response Unit** shall be deemed to be observing the **Maximum Ramp Rate**.

**Energy Limited – State of Energy management rules**

### 6.10

It shall be responsibility of each **Service Provider** to manage the **State of Energy** of any **Response Unit** which is **Energy Limited** (and constituent **Eligible Assets** if any) in order to ensure it can meet the requirements of **Dynamic Containment** and its obligations hereunder.

### 6.11

Without limiting paragraph 6.10, the **Service Provider** shall manage **State of Energy** so as to deliver from the **Response Unit** the **Response Energy Volume** following any activation at any point during the **Contracted EFA Block**, and with respect thereto:

i. at the start of each **Settlement Period** within a **Contracted EFA Block**, the **Service Provider** must assess (in accordance with **Good Industry Practice**) if the **State of Energy** is sufficient to deliver the **Response Energy Volume** as described above, and where **State of Energy** is assessed to be insufficient the **Service Provider** shall, before the end of that **Settlement Period**, calculate and submit a new **Operational Baseline** for either charging or discharging such that the **State of Energy** will become sufficient;

ii. the **Response Unit** should always be capable of recovering at least the volume of **Energy Recovery** in any single **Settlement Period**, through the recalculation and resubmission (where possible) of **Operational Baselines**;
by way of explanation, in the case of a Response Unit providing both DC (low frequency) and DC (high frequency) with an asymmetric Contracted Quantity, the State of Energy requirement will also be asymmetrical;

iv. if stored energy moves outside of this range (for example in response to a Frequency event), the Service Provider must submit at the first opportunity a revised Operational Baseline that will recover the stored energy back to the acceptable range;

v. at its discretion (acting reasonably), NGESO may determine that the Service Provider should not be treated as having failed to manage State of Energy where System Frequency is affected by:-

1. extended periods of high or low System Frequency deviation beyond 0.2 Hz above or below 50Hz; or

2. multiple concurrent frequency events; and

vi. a Response Unit shall not deviate from its Operational Baseline (whether in order to manage State of Energy or otherwise) whilst System Frequency is within the 50Hz +/- 0.015Hz “deadband”.

6.12 If in the reasonable opinion of NGESO a Response Unit is operating during a Contracted EFA Block with a State of Energy which indicates that the Service Provider is not complying with the State of Energy management rules in paragraph 6.11, then NGESO reserves the right to treat that Response Unit as deemed unavailable to deliver Dynamic Containment for the purposes of paragraphs 5 and 7 until such time as NGESO is satisfied (acting reasonably) that the Service Provider is in compliance once more.

6.13 State of Energy may only be managed by way of the submission of, and adherence to, Operational Baselines in accordance with this paragraph 6 (and not, for example, through deliberate imbalance, “spilling” and over/under delivery).

7. Availability Payments

7.1 In respect of each DC Response Contract, NGESO shall, in accordance with paragraph 8, pay to the Service Provider an Availability Payment calculated in accordance with the applicable formulae in Schedule 2 to these DC Service Terms.

7.2 No Availability Payment shall be made by NGESO to the Service Provider pursuant to this paragraph 7 in respect of any period or periods of deemed unavailability pursuant to paragraphs 5 or 6.

7.3 Without prejudice to its other rights and remedies, NGESO reserves the right to withhold payment of any Availability Payment where the Service Provider has failed to provide relevant DC Operational Data and/or DC Performance Data pursuant to paragraph 15.

7.4 With respect to any Transfer Period, and for the avoidance of doubt:

i. for the purposes of this paragraph 7, the availability and provision of Response pursuant to the relevant DC Response Contract shall be assessed by reference to the Response Units(s) Registered to the Secondary Service Provider and not to the Primary Service Provider’s Response Unit; and

ii. all and any Availability Payments accruing due pursuant to this paragraph 7 shall be payable to the Primary Service Provider and nothing in these DC Service Terms shall create any liability or obligation on the part of NGESO to make any such payments to the Secondary Service Provider.

8. Payment Procedure

8.1 In respect of each calendar month during which the Service Provider has been party to one or more DC Response Contracts, and by no later than expiry of the second calendar month which follows, NGESO shall send to the Service Provider in accordance with paragraph 4 (Payments) of the DC General Terms and Conditions a Monthly Statement setting out, in respect of each such DC Response Contract, its calculation of:-

i. the Availability Payments payable to the Service Provider pursuant to paragraph 7;
i. any adjustments made to previous Monthly Statements; and

ii. the resulting net amount due to (or from, as the case may be) the Service Provider,

and in respect thereof the provisions of paragraph 4 (Payments) of the DC General Terms and Conditions shall apply.


9.1 The provision by the Service Provider of Dynamic Containment shall not relieve it of any of its obligations or affect such obligations (where applicable) set out in the Grid Code (including its obligations (if any) to provide Mode A Frequency Response when instructed by NGESO pursuant to the CUSC and/or the Grid Code) or to provide Demand control when instructed by NGESO pursuant to Grid Code OC6) or in the Distribution Code of its host Public Distribution System Operator.

9.2 Without limiting paragraph 9.1, each Service Provider that is or becomes a DRSC Liable User shall, for the duration of each Contracted EFA Block, comply in all respects with the Demand Response Services Code as it refers to Demand Response Active Power Control.

10. Maintenance of Eligible Assets

The Service Provider shall maintain each Eligible Asset to such a standard that the Service Provider can meet its obligations to provide Dynamic Containment in accordance with each DC Response Contract and these DC Service Terms.

11. Third Party Claims

11.1 The Service Provider undertakes to NGESO that the availability and delivery of Dynamic Containment from any Response Unit pursuant to and in accordance with each DC Response Contract and these DC Service Terms (including during any Transfer Period) will not at any time during any Contracted EFA Block cause the Service Provider to be in breach of or to otherwise be non-compliant with any Connection Agreement and/or any agreement for the supply of electricity or related services to or from any constituent Eligible Asset or any Plant and Apparatus associated with it.

11.2 Notwithstanding paragraph 11.1, in the event that the Service Provider (or, during any Transfer Period, any Secondary Service Provider) delivers Dynamic Containment in accordance with these DC Service Terms in consequence of which NGESO suffers or incurs any loss in respect of a claim brought by any third party related to any actual or alleged breach or non-compliance by the Service Provider as described in paragraph 11.1, then the Service Provider shall indemnify NGESO against all and any losses, liabilities, claims, expenses and demands suffered or incurred by NGESO in connection therewith. Such indemnity shall include any legal costs and expenses reasonably incurred in the contesting of such claims including the court costs and reasonable attorney’s fees and other professional advisors’ fees. The Parties agree and accept that, for the purposes of paragraph 5 (Limitations on Liability) of the DC General Terms and Conditions, all such legal costs and expenses expressed to be the subject of such indemnity shall be treated as direct losses.

11.3 In the event of any such claim referred to in paragraph 11.2 being made against NGESO, NGESO shall as soon as reasonably practicable give notice of the claim together with all relevant supporting documentation to the Service Provider. The Service Provider shall be entitled, upon written notice to NGESO and subject to NGESO receiving from the Service Provider such reasonable undertakings as NGESO shall reasonably require to protect NGESO against damage to its name and reputation, to assume at its own expense the sole conduct of all proceedings relating to such claim including the right to contest such claim in the name of NGESO. NGESO shall supply the Service Provider with all information, assistance and particulars reasonably required by the Service Provider in connection therewith. NGESO shall not accept, settle, pay or compromise any such claim without the prior written approval of the Service Provider (not to be unreasonably withheld or delayed). The Service Provider shall reimburse to NGESO all of its reasonable expenses incurred in connection with the provision of any such information, assistance or particulars in the contesting of any such claim.
12. Provision of Other Services

12.1 The Service Provider undertakes to NGESO that the availability and delivery of Dynamic Containment from any Response Unit pursuant to and in accordance with a DC Response Contract and these DC Service Terms will not at any time during any Contracted EFA Block including during any Transfer Period be impaired or otherwise prejudiced by the Service Provider’s (or, during any Transfer Period, any Secondary Service Provider’s) performance of any agreement with a third party (including another Service Provider) relating to any Eligible Asset or any associated Plant and Apparatus, including the making available and/or delivery of services to that third party by the Service Provider (whether by way of increases or reductions in Generation or Demand or stipulated running profiles, participation in any other services (including where part of a trial service) or otherwise, and whether to assist in the management, operation or protection of a User System or pursuant to the Capacity Market Rules or otherwise).

12.2 Notwithstanding paragraph 12.1, and without prejudice to paragraph 12.6, in the event that the Service Provider (or, during any Transfer Period, any Secondary Service Provider) is unable to provide Dynamic Containment (to any extent) in all or any part of any Contracted EFA Block for any reason described in paragraph 12.1, then the Service Provider shall (or shall procure that the Secondary Service Provider shall) give a full explanation to NGESO in its notification of unavailability pursuant to paragraph 5.2, and NGESO may in its absolute discretion (except where paragraph 12.5 applies) terminate the DC Response Contract in question pursuant to paragraph 14.

12.3 Subject always to paragraph 12.4, and irrespective of whether or not NGESO elects to terminate the DC Response Contract, the Service Provider hereby agrees to reimburse NGESO all and any additional costs and expenses incurred by it as a result of such inability including NGESO’s additional costs of alternative or replacement service provision.

12.4 The amount or amounts for which the Service Provider may be liable to reimburse NGESO pursuant to paragraph 12.3 in respect of any single DC Response Contract shall not exceed in aggregate the greater of (1) two hundred and fifty thousand pounds sterling (£250,000), and (2) an amount equal to the aggregate Availability Payments in respect of that DC Response Contract calculated by reference to all Settlement Periods in the relevant Contracted EFA Block (ignoring any periods of unavailability and whether or not declared by the Service Provider).

12.5 Where, during any one or more Settlement Periods in a Contracted EFA Block, a Service Provider is required under the terms of any agreement with NGESO to provide from any Eligible Asset any other Balancing Service (except with respect to Reactive Power) the Parties agree and acknowledge that Dynamic Containment cannot be provided simultaneously with such other Balancing Service and to the extent that such service provision either overlaps to any extent with a Contracted EFA Block and/or is otherwise inconsistent or in conflict with the delivery of Dynamic Containment then without prejudice to the operation of the terms for provision of and payment for such other Balancing Services the relevant Response Unit shall be deemed unavailable to provide such other Balancing Service pursuant to such terms, and availability of the Response Unit to provide Dynamic Containment pursuant to these DC Service Terms shall prevail.

12.6 For the avoidance of doubt, unless otherwise indicated by NGESO in the prevailing DC Participation Guidance Document, different DC Products shall be capable of being provided by a Response Unit simultaneously.

12.7 Where, during any one or more Settlement Periods in a Contracted EFA Block, a Service Provider (or, during any Transfer Period, any Secondary Service Provider) is making available and/or delivering services to a third party in breach of paragraph 12.1, then the relevant Response Unit shall be deemed unavailable for the purposes of paragraph 7.

12.8 For the purposes of this paragraph 12 and for the avoidance of doubt, where a DC Response Contract is formed with respect to a Response Unit which is not registered as a BM Unit and with a Contracted Capacity which is less than the aggregate Registered Quantity of each component Eligible Asset, then the making available and/or delivery of services by the Service Provider to NGESO or a third party from such Eligible Assets or any of them with respect to any or all of that excess capacity shall be deemed to impair, and be inconsistent or in conflict with, the delivery of Dynamic Containment pursuant to such DC Response Contract unless such excess capacity is demonstrated to NGESO’s reasonable satisfaction to be separately metered so as to enable the production of Relevant Data pursuant to paragraph 15.
13. Communications

13.1 Any communications required by these DC Service Terms to be given in writing shall unless otherwise provided in this paragraph 13 be made and deemed to have been received in accordance with paragraph 10 (Notices) of the DC General Terms and Conditions save as may be otherwise agreed by the Parties.

13.2 The Parties consent to the recording of all telephone conversations between them relating in whole or in part to these DC Service Terms, and each Party agrees to notify its employees of that consent and obtain their consent to that recording if required by Law.

13.3 All notifications to be made by the Service Provider with respect to any unavailability (and restoration of availability) of a Response Unit to provide Dynamic Containment pursuant to paragraph 5 shall be made by made as part of DC Operational Data using a Data Concentrator (unless otherwise provided in paragraph 15).

13.4 All Operational Baselines prepared by a Service Provider pursuant to paragraph 6.2 shall be submitted by the Service Provider to NGESO in accordance with paragraphs 6.3 or 6.4 (as applicable), which for Response Units which are BM Participating shall be via BM Unit Data submissions and for Response Units which are not BM Participating shall be submitted using such means as NGESO may direct or (for such period and upon such conditions as NGESO may specify) electronic transfer as part of DC Performance Data.

14. Termination of DC Response Contracts

14.1 In addition to any rights of termination available under the DC Contract Documentation, NGESO may in its absolute discretion terminate a DC Response Contract in respect of a Response Unit with immediate effect by notice in writing to the Service Provider in the following circumstances:

i. where the Service Provider is in breach of a warranty or declaration given under any of the Registration Documents;

ii. where NGESO (acting reasonably) determines that the Response Unit, and/or one or more Eligible Assets comprising the Response Unit, is not ready for commercial operation and/or delivery of Dynamic Containment in one or more Contracted EFA Blocks; or

iii. where the Service Provider fails to comply in any material respect with its obligations under the Testing Documents, including where NGESO determines (acting reasonably) that the Service Provider’s Independent Technical Expert is failing to meet the required technical standard and/or is not sufficiently independent (each as defined in the Testing Documents).

15. Monitoring and Metering Data

15.1 To enable NGESO to verify the Operational Baseline and facilitate calculation of Availability Payments in accordance with paragraph 7 and Schedule 2, and unless and to the extent otherwise directed by NGESO, the Service Provider shall procure and submit to NGESO, on a continuous basis and with a maximum delay of five (5) seconds, the following data (“DC Operational Data”) for each Response Unit, all at a granularity of one (1) measurement per second (1 Hz):

i. Date/time stamp;

ii. whether or not the Response Unit is available for Dynamic Containment pursuant to paragraph 5, and if so whether for DC-low or DC-high;

iii. Metered Active Power Output or Demand (as the case may be); and

iv. where the Response Unit is Energy Limited, its State of Energy in MWh (Active Power Output and Demand).

15.2 All DC Operational Data shall be submitted using such means as NGESO may specify, and shall cover the entirety of each Contracted EFA Block together also with each Settlement Period which falls immediately before and after. Insofar as NGESO is unable to receive State of Energy of a Response Unit as DC Operational Data, then it shall so notify in writing Registered DC Participants, whereupon relevant Service
Providers shall only be required to submit State of Energy form Energy Limited Response Units as part of DC Operational Data from the date 30 days after subsequent notice in writing from NGESO to Registered DC Participants that it is able to receive such submissions, and paragraph 15.1 shall be read and construed accordingly.

Performance data

15.3 In addition, and without limiting paragraph 15.1, to enable NGESO to monitor the delivery of Response pursuant to a DC Response Contract and to facilitate calculation of Availability Payments in accordance with paragraph 7 and Schedule 2, the Service Provider shall procure and retain (for a period of not less than three (3) months) the data specified or referred to in paragraph 15.4 ("DC Performance Data") and shall submit the DC Performance Data to NGESO by electronic transfer on an hourly basis using a Data Concentrator throughout the Contracted EFA Block.

15.4 Unless otherwise specified by NGESO from time to time in the DC Participation Guidance Document, the DC Performance Data shall comprise (at a granularity of twenty (20) measurements per second (20 Hz)), for each Response Unit:-

i. Date/time stamp;

ii. Input Frequency (for one of the relevant Eligible Assets);

iii. whether or not the Response Unit is available for Dynamic Containment pursuant to paragraph 5, and if so whether for DC-low or DC-high;

iv. Metered Active Power Output or Demand (as the case may be);

v. where the Response Unit is Energy Limited, its State of Energy in MWh (Active Power Output and Demand); and

vi. the Performance Baseline, which shall update any Operational Baseline, and shall be either an integer or a value with up to four (4) decimal places.

15.5 All DC Operational Data and DC Performance Data to be provided by the Service Provider pursuant to this paragraph 15:-

i. shall be provided where applicable at an aggregate level for each Response Unit; and

ii. shall be to a margin of error of 0.001 Hz for System Frequency and one percent (1%) for Metered Active Power Output or Demand.

Publication of data

15.6 For the purposes of paragraph 8 (Confidentiality and Announcements) of the DC General Terms and Conditions the Service Provider consents to NGESO publishing all Relevant Data, DC Operational Data and DC Performance Data on its website in a non-anonymised format.

Delivery Failure Report

15.7 Where in relation to any one or more Settlement Periods in a Contracted EFA Block the Availability Payment calculated for a Service Provider is affected by an active K factor (as more particularly described in Schedule 2), then no later than five (5) Business Days following request from NGESO the Service Provider shall provide to NGESO a report in writing (in such form as NGESO may reasonably require) setting out in reasonable detail an explanation for the underlying performance of the relevant Response Unit(s) attributed to such K factor.

16. ABSVD

For the purposes of the ABSVD Methodology Statement, the Service Provider hereby consents (where applicable for and on behalf of the Lead Party of all relevant BM Units) to all and any energy volumes associated with delivery of Response pursuant to these DC Service Terms not being included within the Applicable Balancing Services Volume Data save where the Response Unit is BM Participating in which case energy volumes will be included within the Applicable Balancing Services Volume Data.
17. Transfer of DC Response Contracts

17.1 At any time during the subsistence of a DC Response Contract, a Service Provider (“the Primary Service Provider”) may nominate another Registered DC Participant (“the Secondary Service Provider”) to discharge its obligations to NGESO with respect to the delivery of Response in the applicable Contracted EFA Block pursuant to that DC Response Contract.

17.2 The effect of any such nomination once validated by NGESO pursuant to this paragraph 17 is to treat delivery of Response from one or more Response Units registered to the Secondary Service Provider as if delivered by the Primary Service Provider from its Response Unit for the purposes of these DC Service Terms.

17.3 No nomination shall be valid unless:-

   i. both entitles are Registered DC Participants;

   ii. the Secondary Service Provider has Eligible Assets which are Registered to it and allocated to one or more Response Units pursuant to the DC Participation Guidance Document with sufficient aggregate Registered Quantity and proven capability to deliver Dynamic Containment to enable the DC Response Contract to be discharged during the applicable Contracted EFA Block;

   iii. the specified Transfer Period during which the nomination is to be effective is a period which comprises the entire Contracted EFA Block created by a subsisting DC Response Contract to which the Primary Service Provider is a party; and

   iv. the nomination is validly notified to NGESO pursuant to sub-paragraphs 17.4, 17.5 and 17.6 and the Transfer Notice validated by NGESO.

Transfer Notices

17.4 Each nomination shall be notified to NGESO by the Primary Service Provider by no later than one (1) hour prior to commencement of the applicable Contracted EFA Block, and each such nomination is referred to in these DC Service Terms as a “Transfer Notice”.

17.5 Unless otherwise stipulated in the DC Participation Guidance Document, each Transfer Notice shall comprise the entirety of a Contracted EFA Block, and shall specify:-

   i. the identity of the Primary Service Provider and Response Unit; and

   ii. the identity of the Secondary Service Provider and its Response Unit(s) and Eligible Assets.

17.6 Each nomination shall comprise the entire Contracted Quantity associated with the DC Response Contract during the relevant Transfer Period, and for the avoidance of doubt the Contracted Quantity shall not be capable of being split amongst two or more Secondary Service Providers.

17.7 In giving a Transfer Notice, the Primary Service Provider warrants that the Secondary Service Provider accepts the nomination.

17.8 NGESO shall notify the Primary Service Provider as soon as reasonably practicable following receipt of the Transfer Notice whether or not the Transfer Notice has been validated. In the absence of any notification by NGESO of validation of the Transfer Notice by commencement of the relevant Contracted EFA Block the Transfer Notice shall be deemed not to have been validated.

17.9 Where in NGESO’s reasonable opinion the delivery of Response pursuant to the DC Response Contract during the Transfer Period by the Secondary Service Provider’s designated Response Unit(s) would or might endanger operational security within the meaning of the System Operator Guidelines, then NGESO shall so notify both Registered DC Participants whereupon the Transfer Notice shall be deemed withdrawn.

17.10 A Transfer Notice shall be invalid if the Secondary Service Provider’s designated Response Unit or any Eligible Asset allocated to it is the subject of a DC Response Contract for the same Contracted EFA Block, in which case NGESO shall so notify both whereupon the Transfer Notice shall be deemed withdrawn.

Cancellation Notice
17.11 A Transfer Notice may be cancelled by the Primary Service Provider (but not under any circumstances by the Secondary Service Provider) by notification to NGESO in writing ("Cancellation Notice") specifying the date and time from which the cancellation is to be effective.

*Effect of Transfer Notice*

17.12 For the duration of each Transfer Period (or any earlier period where the Transfer Period comes to an end pursuant to the foregoing provisions), NGESO consents to the Primary Service Provider’s obligation to deliver Response pursuant to the relevant DC Response Contract being discharged on its behalf by the Secondary Service Provider from its Response Unit(s).

*Form of notifications*

17.13 All Transfer Notices and Cancellation Notices and other notifications related thereto between the Parties referred to in this paragraph 17 shall be made using the method of communication specified from time to time by NGESO.
Service parameters

The service parameters below are included solely for the interpretation and understanding of the above tables and the formulae in Schedule 2. In the event of any conflict or inconsistency between these service parameters and terminology used or defined elsewhere in the DC Procurement Documents, the former shall prevail.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>I.D</th>
<th>Value (possible range)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency &amp; delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal frequency</td>
<td>Statutory system frequency for GB</td>
<td>f_n</td>
<td>50 Hz</td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
<td>I.D</td>
<td>Value (possible range)</td>
<td>Comment</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----</td>
<td>------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Target frequency</td>
<td>System frequency that NGESO aims to achieve</td>
<td>$f_0$</td>
<td>50 Hz</td>
<td></td>
</tr>
<tr>
<td>Dead-band frequency range</td>
<td>Frequency range over which the service does not deliver</td>
<td>$f_d$</td>
<td>$f_0 - 0.015Hz$ to $f_0 + 0.015Hz$</td>
<td>This has been specified to align with SOGL Article 154, Annex 5. Active power delivery will commence at $f_d$</td>
</tr>
<tr>
<td>Knee-point frequency</td>
<td>Frequency set point which defines the beginning of the delivery curve</td>
<td>$f_a$</td>
<td>$f_a +/- 0.2Hz$</td>
<td>The knee point describes where delivery of the service begins.</td>
</tr>
<tr>
<td>Full delivery frequency (saturation)</td>
<td>Frequency set point at which the service must deliver full contracted quantity ($Q_{contract(h,l)}$)</td>
<td>$f_s$</td>
<td>$f_s +/- 0.5Hz$</td>
<td>At this frequency set point the service must deliver the full contracted quantity.</td>
</tr>
<tr>
<td>Quantity at target and deadband</td>
<td>The percentage amount of $Q_{contract}$ to be delivered at $f_0$ and $f_d$</td>
<td>$R_0$</td>
<td>0 %</td>
<td></td>
</tr>
<tr>
<td>Quantity at knee-point</td>
<td>The percentage amount of $Q_{contract}$ to be delivered at $f_a$</td>
<td>$R_a$</td>
<td>5 %</td>
<td>The delivery profile is linear between $f_d$ and $f_a$</td>
</tr>
<tr>
<td>Quantity at saturation</td>
<td>The percentage amount of $Q_{contract}$ to be delivered at $f_s$</td>
<td>$R_s$</td>
<td>100 %</td>
<td>At the full delivery frequency the service must deliver 100 % of the contracted quantity.</td>
</tr>
</tbody>
</table>

**Contract quantity parameters**

<table>
<thead>
<tr>
<th>Contracted quantity</th>
<th>The amount of service that a provider is contracted to deliver. Can be either high or low frequency, or both.</th>
<th>$Q_{contract(h,l)}$</th>
<th>Min 1MW</th>
<th>$h$ refers to contracted quantity for high frequency service. $l$ refers to contracted quantity for low service. This is the <strong>Contracted Quantity</strong> as defined in the DC Glossary.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contracted LF quantity</td>
<td>The quantity of LF service that a provider is contracted to deliver</td>
<td>$P$</td>
<td>Min 1MW</td>
<td>Is equivalent to $Q_{contract(l)}$</td>
</tr>
<tr>
<td>Contracted HF quantity</td>
<td>The quantity of HF service that a provider is contracted to deliver</td>
<td>$Q$</td>
<td>Min 1MW</td>
<td>Is equivalent to $Q_{contract(h)}$</td>
</tr>
</tbody>
</table>

**Energy limited parameters**

<p>| Delivery duration                 | Time that an energy limited provider must be capable of                                                  | $T_{sus}$ | 15 minutes | Initial investigation suggests maximum event duration is ~5mins, initial value aligned with SOGL Article 127 Annex 3. |</p>
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>I.D</th>
<th>Value (possible range)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>sustained delivery of</td>
<td>The volume of stored energy required to be delivered before State of Energy management is required to avoid unavailability</td>
<td>VmaxC(h,l)</td>
<td><em>VmaxC(h,l) = (T_{sus} / 60) x Q_{contract} MWh</em></td>
<td>This is NOT the maximum energy volume that could be delivered over the duration of a Contracted EFA Block.</td>
</tr>
<tr>
<td>Response energy volume</td>
<td>The minimum volume of energy recovery possible (by submission of Operational Baseline) in a single settlement period. As a percentage of V_{maxC(h,l)}</td>
<td>V_{rec(h,l)}</td>
<td>20%</td>
<td>Applicable only to energy limited providers. This equates to 3 minutes of energy when T_{sus} is 15 minutes.</td>
</tr>
<tr>
<td>Energy recovery</td>
<td></td>
<td>V_{rec(h,l)}</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Response delivery parameters</td>
<td></td>
<td>V_{rec(h,l)}</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Max initiation time</td>
<td>The maximum time between a change in frequency and change in the delivery of response</td>
<td>T_{MAX}</td>
<td>0.5 s</td>
<td>The provider must begin their response to a change in frequency between 0.25 s and 0.5 s after the deviation occurred.</td>
</tr>
<tr>
<td>Max time to full delivery</td>
<td>The maximum time between frequency deviation occurring and delivery of the saturation quantity (R_s)</td>
<td>T_{dMAX}</td>
<td>1.0 s</td>
<td>For a change in frequency that requires a change in response from 0 to R_s this is the maximum time it should take.</td>
</tr>
<tr>
<td>Ramp time upper bound</td>
<td>The upper time bound of start of delivery to delivery of full contracted quantity</td>
<td>t_{rmax}</td>
<td>0.5 s</td>
<td>Equivalent to (T_{dMAX} – T_{MAX}). If the provider initiates response at latest possible time, this is the longest duration that a response unit can reach saturation quantity (R_s) output after initiation at the max initiation time.</td>
</tr>
<tr>
<td>Maximum ramp rate for Baselines</td>
<td>The maximum ramp rate per minute permitted at any point within a baseline submitted by an energy limited provider as a percentage of</td>
<td>RR_{bp(h,l)}</td>
<td>5% per minute</td>
<td>The ramp rate limit can be calculated from the contracted quantity. There will be a different maximum ramp rate if the volumes of high/low response are different – please see the DC Participation Guidance.</td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
<td>I.D</td>
<td>Value (possible range)</td>
<td>Comment</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----</td>
<td>------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>contracted quantity</td>
<td>$Q_{\text{contract}}(h,l)$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error tolerance for full payment</td>
<td>The response error up to and including where no performance payment penalties are applied.</td>
<td>A</td>
<td>0.03</td>
<td>This is an error of 3% of contracted quantity. See Schedule 2.</td>
</tr>
<tr>
<td>Error limit for zero payment</td>
<td>The response error at and above which performance payment penalties are 100%.</td>
<td>B</td>
<td>0.07</td>
<td>This is an error of 7% of contracted quantity (with linear interpolation of penalties between 3% and 7%) See Schedule 2.</td>
</tr>
</tbody>
</table>
SCHEDULE 2 - AVAILABILITY PAYMENTS

Calculation of Settlement Value
The payment formula is:

\[ S_{ie} = \left( \sum_{j} \text{Round} \left( P_{ij} \times V_{ij}, 2 \right) \times F_{ij} \right) \times K_{e} \]

Where

- \( S_{ie} \) is the settlement value for the relevant DC Product calculated in respect of Response Unit \( i \) for the applicable Contracted EFA Block \( e \)
- \( \sum_{j} \) is the summation over the Settlement Period \( j \) in the relevant Contracted EFA Block \( e \)
- \( P_{ij} \) is the applicable Market Clearing Price, in GBP/MW/h, for the relevant Contracted EFA Block \( e \) and DC Product
- \( V_{ij} \) is the Contracted Quantity in megawatts, in respect of Response Unit \( i \) and Settlement Period \( j \), for the relevant Contracted EFA Block \( e \)
- \( F_{ij} \) is zero where there is any period or periods of unavailability within Settlement Period \( j \) during the relevant Contracted EFA Block \( e \), otherwise is 1
- \( K_{e} \) is defined in the remainder of this Schedule 2 below.

The performance monitoring scheme for Dynamic Containment adjusts the value calculated for a Contracted EFA Block by a factor \( K \) based on the worst of the performance scores in that Contracted EFA Block. Performance scores are described below, calculated using performance bounds to represent valid response delivery. Performance bounds are a pair of time series that enclose possible valid dynamic containment delivery profiles – this accounts for different lag times and ramp rate between services.

NGESO may at its sole discretion (but shall not be obliged to) ignore a performance score when determining factor \( K \) in the calculation of the settlement value for any particular Contracted EFA Block:

(i) where the Response Unit in question is Energy Limited, and the performance monitoring error in question arose due to inadequate State of Energy in circumstances where the Service Provider was compliant in all respects with the State of Energy management rules in paragraph 6.11; or

(ii) where that Contracted EFA Block falls in a ‘grace period’ to which NGESO has given its prior agreement in writing (which shall not exceed fourteen (14) consecutive days) to recognise on-boarding by the relevant Service Provider of control systems and other IS interfaces necessary for the delivery and monitoring of Dynamic Containment.

Metered response is derived from DC Operational Data and DC Performance Data for the relevant Response Unit obtained by NGESO pursuant to paragraph 15 of these DC Service Terms.

Determination of \( K \) factor
Response Curve
The Dynamic Containment response curve is defined as the linear interpolation between 6 pairs of frequency and response % delivery.

<table>
<thead>
<tr>
<th></th>
<th>( f_{\pm} = f_{0} \pm \text{Hz} )</th>
<th>( R_{\pm} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saturation</td>
<td>( f_{s_{\pm}} = f_{0} \pm 0.5 \text{Hz} )</td>
<td>( \mp 100% )</td>
</tr>
<tr>
<td>Activation</td>
<td>( f_{a_{\pm}} = f_{0} \pm 0.2 \text{Hz} )</td>
<td>( \mp 5% )</td>
</tr>
<tr>
<td>Delivery/deadband</td>
<td>( f_{d_{\pm}} = f_{0} \pm 0.015 \text{Hz} )</td>
<td>( 0% )</td>
</tr>
</tbody>
</table>
These are the equations for LF and HF only containment response curves.

\[ R_{\text{sym}}(f) = \begin{cases} 
  R_s^- : f < f_s^- \\
  R_A^- + \frac{R_s^- - R_A^-}{f_s^- - f_A^-} \times (f - f_A^-) : f_s^- \leq f < f_A^- \\
  \frac{R_A^-}{f_A^- - f_D^-} \times (f - f_D^-) : f_A^- \leq f < f_D^- \\
  0 : f_D^- \leq f < f_D^+ \\
  \frac{R_A^+}{f_A^+ - f_D^+} \times (f - f_D^+) : f_D^+ \leq f < f_A^+ \\
  R_A^+ + \frac{R_{s^+} - R_{A^+}}{f_{s^+} - f_{A^+}} \times (f - f_{A^+}) : f_{A^+} \leq f < f_{s^+} \\
  0 : f_{s^+} \leq f
\]

\[ R_{\text{LF}}(f) = \begin{cases} 
  R_s^- : f < f_s^- \\
  R_A^- + \frac{R_s^- - R_A^-}{f_s^- - f_A^-} \times (f - f_A^-) : f_s^- \leq f < f_A^- \\
  \frac{R_A^-}{f_A^- - f_D^-} \times (f - f_D^-) : f_A^- \leq f < f_D^- \\
  0 : f_D^- \leq f < f_D^+ \\
  R_A^+ + \frac{R_{s^+} - R_{A^+}}{f_{s^+} - f_{A^+}} \times (f - f_{A^+}) : f_{A^+} \leq f < f_{s^+} \\
  0 : f_{s^+} \leq f
\]

\[ R_{\text{HF}}(f) = \begin{cases} 
  R_A^+ \times (f - f_D^+) : f_D^+ \leq f < f_A^+ \\
  0 : f < f_D^+
\]

Lags and ramp limits
Lag upper bound (maximum initiation time): $T_{i\text{MAX}} = 0.50 \text{ s}$

Lag upper bound tolerance: $tol_{i\text{MAX}} = 0.05 \text{ s}$

Ramp time upper bound: $tr_{\text{max}} = T_{i\text{MAX}} - T_{i\text{MAX}} = 0.50\text{ s}$

Ramp rate (proportional) lower bound: $r_{\text{min}} = \frac{1}{tr_{\text{max}}} = 2 \text{ s}^{-1}$

**Performance bounds definition**

**Frequency bounds**

The frequency bounds are used in the definition of the performance bounds. The upper and lower frequency bounds describe the highest and lowest frequencies that can be found within the lag window.

Upper frequency band at time $t$:

$$F_{\text{upper}}(t) = \max_{0 \leq t_{\text{lag}} \leq T_{i\text{MAX}} + tol_{i\text{MAX}}} f(t - t_{\text{lag}})$$

Lower frequency band at time $t$:

$$F_{\text{lower}}(t) = \min_{0 \leq t_{\text{lag}} \leq T_{i\text{MAX}} + tol_{i\text{MAX}}} f(t - t_{\text{lag}})$$

Where $f(t)$ is the **Input Frequency** at time $t$.

Figure 1: Example of frequency bounds calculation
**Ramp limits**

Ramp limits are applied to the response curves used in the calculation of the performance bounds. The ramp limits are defined as limits to the rate of change of response.

Upwards ramp limit for function $R(t)$ with lower ramp limit $r$:

$$\text{RLU}(R(t), r) = \begin{cases} R(t) & R(t) > RLU_{\text{prev}} + r \times \Delta t \\ R(t) - r \times \Delta t & \text{otherwise} \end{cases}$$

Where $RLU_{\text{prev}} = RLU(R(t - \Delta t), r)$

Downwards ramp limit for function $R(t)$ with lower ramp limit $r$:

$$\text{RLD}(R(t), r) = \begin{cases} R(t) & R(t) < RLD_{\text{prev}} - r \times \Delta t \\ R(t) + r \times \Delta t & \text{otherwise} \end{cases}$$

**Performance bounds**

The upper bound $UB(t)$ is the response curve applied to the lower lagged frequency, with the ramp limit applied when decreasing.

The lower bound $LB(t)$ is the response curve applied to the upper lagged frequency, with the ramp limit applied when increasing.

For the first 0.55 seconds after a response unit begins delivery, after a period of missing data, or after switching from unavailable to available the upper and lower performance bounds will be set to $P$ and $-Q$ respectively.

To allow time to change between contracts (a change in $P$ or $Q$): the performance bounds will be calculated for 1 second after the change using whichever of the contracts gives the lower bound, and the higher upper bound.

**Performance bounds for LF only**

$$UB_{LF}(t) = RLD\left( R_{LF}(F_{\text{lower}}(t), rr_{\text{min}}) \right) \times P$$

$$LB_{LF}(t) = RLU\left( R_{LF}(F_{\text{upper}}(t), rr_{\text{min}}) \right) \times P$$

**Performance bounds for HF only**

$$UB_{HF}(t) = RLD\left( R_{HF}(F_{\text{lower}}(t), rr_{\text{min}}) \right) \times Q$$

$$LB_{HF}(t) = RLU\left( R_{HF}(F_{\text{upper}}(t), rr_{\text{min}}) \right) \times Q$$

**Performance bounds for LF and HF**

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

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

\[ ub(t) = RLD( R_{sym}(F_{lower}(t)), r_{min} ) \]
\[ lb(t) = RLU( R_{sym}(F_{upper}(t)), r_{min} ) \]

**Figure 2:** Example of symmetric performance bounds calculation using the frequency bounds from figure 1

### Error calculation

The performance monitoring error is zero if the metered response is between the upper and lower performance bounds and is otherwise the difference between the metered response and the closer of the performance bounds.

The error \( e_m \) for one time measurement and metered response \( R \):

\[
e_m = \begin{cases} 
    LB - R & R < LB \\
    0 & LB \leq R \leq UB \\
    R - UB & R > UB 
\end{cases}
\]
Scaled error $e_{sm}$ for one measurement:

For $P > 0, Q = 0$:

$$e_{sm} = \frac{e_m}{P}$$

For $Q > 0, P = 0$:

$$e_{sm} = \frac{e_m}{Q}$$

For $P > 0, Q > 0$:

$$e_{sm} = \begin{cases} \frac{e_m}{Q} & \text{if } F_{\text{lower}} > 50 \\ \frac{e_m}{P} & \text{if } F_{\text{upper}} < 50 \\ \frac{e_m}{\text{max}(P,Q)} & \text{otherwise} \end{cases}$$

The performance score for a Settlement Period is:

$$E = \max_m \left( \text{rolling minimum } e_{sm} \right)$$

This is used to derive a K factor for Settlement Period $j$, being:

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

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

The K factor for the Contracted EFA Block is then:

$$K_e = \min_j k_j$$
Figure 3: Payment adjustment (K factor) curve