

New Response Services Service Terms

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1. Introduction

- 1.1 These **Response Service Terms** describe the requirements for provision of **Response Services** procured by **NGESO** under **Auctions** and the basis upon which **NGESO** shall make payments in respect thereof, and shall apply to each **Service Provider** and **Response Unit** the subject of a **Response Contract** where, in accordance with the **Response Procurement Rules**, and for any **EFA Block** and **Auction Product**, the **Service Provider's Sell Order** for that **Response Unit** is accepted by **NGESO**.
- 1.2 Each **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, the relevant **Auction Product**, to be delivered during the relevant **Contracted EFA Block** upon the terms of these **Response 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 an **Auction Product** except pursuant to **Response Contracts**.
- 1.3 A **Response Contract** shall relate to a single **Response Unit** and shall apply only to a single **EFA Block** and **Auction Product**.
- 1.4 Neither **Party** may terminate a **Response Contract** once formed except as provided or referred to in paragraph 14 or by agreement in writing between the **Parties**.
- 1.5 These **Response Service Terms** should be read alongside the **Response Procurement Documentation** of which they form a part.

2. Changes to these Response Service Terms

- 2.1 Subject always to paragraph 2.2, **NGESO** may update these **Response 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 **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 Regulation** (and by reference to those provisions of the **Response Procurement Documentation** constituting terms and conditions approved by the **Authority** as the terms and conditions related to balancing pursuant to Article 18 of the **Electricity Balancing Regulation**), any variation to these **Response Service Terms** will be proposed and implemented in accordance with the applicable requirements in the **Electricity Balancing Regulation**.

3. Defined Terms

- 3.1 Unless defined in paragraph 3.2 below, or the context otherwise requires, any capitalised term used in these **Response Service Terms** shall have the meaning given to it (if any) in the prevailing **Response Procurement Rules** or **Balancing Services Glossary of General Terms and Rules of Interpretation** (as the case may be).
- 3.2 In these **Response Service Terms**:
- 3.2.1 “**Cancellation Notice**” shall have the meaning given to it in paragraph 21.1;
- 3.2.2 “**Disarming Instruction**” shall have the meaning given to it in paragraph 6.14;
- 3.2.3 “**Monthly Statement**” shall have the meaning given to it in paragraph 1 of Schedule 3;
- 3.2.4 “**Operational Data**” shall have the meaning given to it in paragraph 15.1;
- 3.2.5 “**Performance Data**” shall have the meaning given to it in paragraph 15.4;
- 3.2.6 “**Primary Service Provider**” shall have the meaning given to it in paragraph 21.1;
- 3.2.7 “**Re-Arming Instruction**” shall have the meaning given to it in paragraph 6.14;
- 3.2.8 “**Secondary Service Provider**” shall have the meaning given to it in paragraph 21.1;
- 3.2.9 “**Transfer Notice**” shall have the meaning given to it in paragraph 21.4;

3.2.10 “**Transfer Period**” shall mean the period described as such in a **Transfer Notice** as may be shortened upon the cancellation or withdrawal of that **Transfer Notice** or otherwise in accordance with paragraph 21.

3.3 For the purposes of paragraph 3.1, with respect to any **Response Contract**, “prevailing” shall mean the latest version of the applicable document which is in effect at the time of formation of that **Response Contract**.

4. Interpretation

4.1 The rules of interpretation set out in the **Balancing Services Glossary of General Terms and Rules of Interpretation** shall apply to these **Response Service Terms**.

5. 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 **Response Contract**, the applicable **Auction Product** 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 **Response Contract** that, unless prevented by an unplanned outage or other unforeseen technical circumstances, a **Response Unit** will be available to provide that **Auction Product** in accordance with these **Response 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 **Operational Data** or (only if directed by **NGESO**) by way of submission of **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 comply with a **Disarming Instruction** or **Re-Arming Instruction** or with any other requirement of the applicable **Auction Product** in accordance with these **Response Service Terms**.

5.3 The submission of **Operational Data** (or, where applicable, **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 the applicable **Auction Product** in accordance with these **Response 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 paragraphs 5.6 and 5.8, with effect from the start of the **Settlement Period** in which the **Response Unit** becomes unable to meet the requirements of the relevant **Auction Product** (in whole or part, and 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 **Auction Product** is restored (or, if later, the time when the **Service Provider** notifies **NGESO** that it has been restored), the **Response Unit** shall, for the purposes of paragraph 7, be deemed to be unavailable to deliver the **Auction Product**.

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 **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 the applicable **Auction Product** for the entirety of the **Contracted EFA Block** in question (including any part thereof prior to the commencement of unavailability).

5.8 A **Response Unit** shall not be considered unavailable by reason solely of its inability to comply with a **Disarming (or Re-Arming) Instruction**.

5.9 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**.

5.10 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 **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 the relevant **Auction Product** pursuant to paragraph 5 or is required to comply with a **Disarming Instruction**, 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.

Operational Baselines

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 **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 Response 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 writing from time to time) 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 **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 the applicable **Auction Product** 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 applicable capability data tables at Schedule 1 (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 of up to but not including + 0.015 Hz (in the case of the **HF Auction Products**) or up to but not including – 0.015 Hz (in the case of the **LF Auction Products**) in each case from **Target Frequency**, and from the edge of that dead band up to and including + 0.1 Hz (in the case of **HF Auction Products**) or up to and including – 0.1 Hz (in the case of the **LF Auction Products**) the required level of **Response** shall be either:-
 - 1. in the case of the **DM-H**, a linear increase to a maximum of five percent (5%) of **Contracted Quantity** at + 0.1 Hz, and from that point the required level of **Response** shall be a linear increase to one hundred percent (100%) of **Contracted Quantity** at + 0.2 Hz;
 - 2. in the case of the **DM-L**, a linear increase to a maximum of five percent (5%) of **Contracted Quantity** at – 0.1 Hz, and from that point the required level of **Response** shall be a linear increase to one hundred percent (100%) of **Contracted Quantity** at – 0.2 Hz;
 - 3. in the case of the **DR-H**, the required level of **Response** shall be a linear increase to one hundred percent (100%) of **Contracted Quantity** at + 0.2 Hz;
 - 4. in the case of the **DR-L**, the required level of **Response** shall be a linear increase to one hundred percent (100%) of **Contracted Quantity** at - 0.2 Hz;
 - 5. the case of the **DC-H**, the required level of **Response** shall be a linear increase to five percent (6%) of **Contracted Quantity** at + 0.2 Hz; and
 - 6. the case of the **DC-L**, the required level of **Response** shall be a linear increase to five percent (5%) of **Contracted Quantity** at + 0.2 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) Hz.

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 the applicable **Auction Product** 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. the **Maximum Ramp Rate** shall be calculated by reference to whether the **Response Unit** is providing either or both of the LF or HF **Auction Products** of the same **Response Service**, 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 the 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 the applicable **Auction Product** 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**;
 - iii. by way of explanation, in the case of a **Response Unit** providing both the LF and HF **Auction Products** of the same **Response Service** 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 0.1 Hz above or below 50Hz; or
 2. multiple concurrent frequency events; and

- vi. for **Dynamic Regulation**, 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” (but for the avoidance of doubt a **Response Unit** which is not **Energy Limited** may deviate from its **Operational Baseline** whilst **System Frequency** is within such “deadband” to the extent it is providing equivalent **Mode A Frequency Response** up to the **Contracted Quantity**).

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 the applicable **Auction Product** 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).

Disarming (and Re-Arming) Instructions

6.14 At any time during a **Contracted EFA Block**, **NGESO** may issue an instruction to the **Service Provider** to cease provision of the applicable **Auction Product** (“**Disarming Instruction**”), and such **Disarming Instruction** shall remain in place for the remainder of that **Contracted EFA Block** and all any subsequent **Contracted EFA Blocks** until **NGESO** instructs the **Service Provider** that provision of that **Auction Product** can resume from that **Response Unit** (“**Re-Arming Instruction**”).

6.15 All **Disarming Instructions** and **Re-Arming Instructions** shall be given by **NGESO** by electronic means, which shall be acknowledged by the **Service Provider** also by electronic means within two (2) minutes of receipt.

6.16 No later than two (2) minutes following receipt of a **Disarming Instruction**, the **Service Provider** shall procure that the **Response Unit** (and its constituent **Eligible Asset(s)**) is disarmed such that no **Response** is provided and the **Response Unit** resumes operation in accordance with its then prevailing **Operational Baseline**.

6.17 No later than two (2) minutes following receipt of a **Re-Arming Instruction** (if given during a **Contracted EFA Period**), the **Service Provider** shall procure that the **Response Unit** (and its constituent **Eligible Asset(s)**) is re-armed such that provision of the applicable **Auction Product** is resumed in accordance with this paragraph 6.

6.18 For the purpose of paragraphs 5 and 7 the issue of a **Disarming Instruction** shall not affect payment of the **Availability Payment** during the relevant **Contracted EFA Block(s)**, save that operation of the **Response Unit** shall be monitored by **NGESO** during the remainder of the **Contracted EFA Block** and **NGESO** shall be entitled to treat the **Response Unit** as armed and continuing to deliver the applicable **Auction Product** until such time as **NGESO** is satisfied (acting reasonably) that the **Service Provider** has complied with the **Disarming Instruction**.in accordance with paragraph 6.16.

7. Availability Payments

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

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 **Operational Data** and/or **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 **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 **Response 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 **Response Contracts**, **NGESO** shall send to the **Service Provider** a **Monthly Statement** setting out, in respect of each such **Response Contract**, its calculation of:-

- i. the **Availability Payments** payable to the **Service Provider** pursuant to paragraph 7;
- ii. any adjustments made to previous **Monthly Statements**; and
- iii. the resulting net amount due to (or from, as the case may be) the **Service Provider**,

and in respect thereof the provisions of Schedule 3 shall apply.

9. Grid Code and Distribution Code

9.1 The provision by the **Service Provider** of an **Auction Product** 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 the applicable **Auction Product** in accordance with each **Response Contract** and these **Response Service Terms**.

11. Third Party Claims

11.1 The **Service Provider** undertakes to **NGESO** that the availability and delivery of the applicable **Auction Product** from any **Response Unit** pursuant to and in accordance with each **Response Contract** and these **Response 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 the applicable **Auction Product** in accordance with these **Response 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 18 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 the applicable **Auction Product** from any **Response Unit** pursuant to and in accordance with a **Response Contract** and these **Response 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 the applicable **Auction Product** (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 **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 **Response Contract**, the **Service Provider** hereby agrees to reimburse to 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 **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 **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 to the extent that such service provision is inconsistent or in conflict with the delivery of the applicable **Auction Product** (as determined by NGESO acting reasonably) then the applicable **Auction Product** cannot be provided simultaneously with such other **Balancing Service**. Accordingly, unless pursuant to the terms for provision of and payment for such other **Balancing Services** the relevant **Response Unit** is deemed unavailable to provide the applicable **Auction Product** or except as may otherwise be specified by NGESO, the relevant **Response Unit** shall be deemed unavailable to provide such other **Balancing Service**, and availability of the **Response Unit** to provide the applicable **Auction Product** pursuant to these **Response Service Terms** shall prevail.
- 12.6** For the avoidance of doubt, paragraph 12.5 shall not affect the submission by a **Service Provider** of bids and offers (and the issue of **Bid-Offer Acceptances**) under the **Balancing Mechanism** where not made pursuant to terms agreed with NGESO for provision of any other **Balancing Service**, and furthermore unless otherwise indicated in writing by NGESO from time to time, the **Auction Products** of the same **Response Service** shall be capable of being provided by a **Response Unit** simultaneously. Further information regarding simultaneous provision of the **Response Services** is contained in the **Stacking Guidance** as published by NGESO from time to time.
- 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 **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 the applicable **Auction Product** pursuant to such **Response Contract** unless such excess capacity is demonstrated to **NGESO's** reasonable satisfaction to be separately metered so as to enable the production of **Operational Data** and **Performance Data** pursuant to paragraph 15.

13. Communications

- 13.1 Any communications required by these **Response 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 26 (*Notices*) 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 **Response 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 the applicable **Auction Product** pursuant to paragraph 5 shall be made as part of **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 **Performance Data**.

14. Termination of Response Contracts

- 14.1 Either **Party** shall have the right to terminate a **Response Contract** in the circumstances set out in paragraph 8.1 of the prevailing **Common Flexibility Service Terms and Conditions** as if paragraphs 8.1 and 8.2 were set out in full herein.
- 14.2 Without prejudice to paragraph 14.1, and in addition to any other rights of termination available under the **Response Procurement Documentation**, **NGESO** may in its absolute discretion terminate a **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 material breach of a warranty or declaration given as part of the **Registration and Prequalification Procedure** or under any of the **Response Procurement Documentation**;
 - 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 the applicable **Auction Product**; or
 - iii. where the **Service Provider** fails to comply in any material respect with its obligations under the **Testing Rules** 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 Rules**).
- 14.3 Paragraphs 8.4 to 8.6 inclusive of the prevailing **Common Flexibility Service Terms and Conditions** shall apply as if set out in full herein.

15. Monitoring and Metering Data

Operational 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 ("**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 the applicable **Auction Product** pursuant to paragraph 5;
- iii. whether or not the **Response Unit** is the subject of a **Disarming Instruction**;
- iv. **Metered Active Power Output** or **Demand** (as the case may be); and
- v. where the **Response Unit** is **Energy Limited**, its **State of Energy** in MWh (**Active Power Output** and **Demand**).

15.2 All **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 **Operational Data**, then it shall so notify in writing **Registered Response Participants**, whereupon relevant **Service Providers** shall only be required to submit **State of Energy** from **Energy Limited Response Units** as part of **Operational Data** from the date 30 days after subsequent notice in writing from **NGESO** to **Registered Response 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 **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 ("**Performance Data**") and shall submit the **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** in writing from time to time, whether or not the **Response Unit** is the subject of a **Disarming Instruction**, the **Performance Data** shall comprise (at a granularity of twenty (20) measurements per second (20 Hz) or alternatively in the case of **Dynamic Regulation** only two (2) measurements per second (2Hz)), 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 the applicable **Auction Product** pursuant to paragraph 5;
- 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 **Operational Data** and **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 22 (*Confidentiality*) the **Service Provider** consents to **NGESO** publishing all **Operational Data** and **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.

Measurement of frequency

- 15.8 For the purposes of this paragraph 15, the **Parties** agree that **System Frequency** shall be measured in accordance with the **Frequency Measurement Standard**.

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 **Response 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. Force Majeure

- 17.1 Save for paragraphs 10.2.2 and 10.4 which shall not apply, paragraph 10 of the prevailing **Common Flexibility Service Terms and Conditions** shall apply as if set out in full herein.

18. Liability, Indemnity and Insurance

- 18.1 Paragraph 11 of the prevailing **Common Flexibility Service Terms and Conditions** shall apply as if set out in full herein.

19. Records and Audits

- 19.1 Paragraph 5 of the prevailing **Common Flexibility Service Terms and Conditions** shall apply as if set out in full herein.

20. Assignment

- 20.1 Paragraph 12 of the prevailing **Common Flexibility Service Terms and Conditions** shall apply as if set out in full herein.

21. Transfer of Response Contracts

- 21.1 At any time during the subsistence of a **Response Contract**, a **Service Provider** (the "**Primary Service Provider**") may nominate another **Registered Response 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 **Response Contract**.

- 21.2 The effect of any such nomination once validated by **NGESO** pursuant to this paragraph 21 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 **Response Service Terms**.

- 21.3 No nomination shall be valid unless:-
- i. both entities are **Registered Response 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 **Response Procurement Rules** with sufficient aggregate **Registered Quantity** and proven capability to deliver the applicable **Auction Product** to enable the **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 **Response Contract** to which the **Primary Service Provider** is a party; and
 - iv. the nomination is validly notified to **NGESO** pursuant to paragraphs 21.4, 21.5 and 21.6 and the **Transfer Notice** validated by **NGESO**.

Transfer Notices

- 21.4 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 **Response Service Terms** as a “**Transfer Notice**”.
- 21.5 Unless otherwise specified in writing by **NGESO** from time to time, 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**.
- 21.6 Each nomination shall comprise the entire **Contracted Quantity** associated with the **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**.
- 21.7 In giving a **Transfer Notice**, the **Primary Service Provider** warrants that the **Secondary Service Provider** accepts the nomination.
- 21.8 **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.
- 21.9 Where in **NGESO**'s reasonable opinion the delivery of **Response** pursuant to the **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 **Electricity Transmission System Operation Regulation**, then **NGESO** shall so notify both **Registered Response Participants** whereupon the **Transfer Notice** shall be deemed withdrawn.
- 21.10 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 **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

- 21.11 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

- 21.12 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 **Response Contract** being discharged on its behalf by the **Secondary Service Provider** from its **Response Unit(s)**.

Form of notifications

21.13 All **Transfer Notices** and **Cancellation Notices** and other notifications related thereto between the **Parties** referred to in this paragraph 21 shall be made using the method of communication specified from time to time by **NGESO**.

22. Confidentiality

22.1 The provisions of paragraph 12 of the prevailing **Common Flexibility Service Terms and Conditions** shall apply to all and any information provided by **NGESO** or any **Registered Response Participant** to the other (whether orally or in writing) pursuant to or in connection with these **Response Service Terms** as if set out in full herein.

23. Intellectual Property Rights

23.1 The provisions of paragraph 14 of the prevailing **Common Flexibility Service Terms and Conditions** shall apply to all **Intellectual Property Rights** owned by or licensed to either **Party** as if set out in full herein.

24. Data Protection

24.1 The provisions of paragraph 15 of the prevailing **Common Flexibility Service Terms and Conditions** shall apply as if set out in full herein.

25. Modern Slavery, Anti-bribery and Living Wage

25.1 The provisions of paragraph 16 of the prevailing **Common Flexibility Service Terms and Conditions** shall apply as if set out in full herein, and without limitation as at the date of formation of each **Response Contract** the **Service Provider** warrants, represents and undertakes to **NGESO** in the manner set out in paragraph 16.1 thereof and indemnifies **NGESO** as provided in paragraphs 16.2 and 16.7 thereof.

25.2 Any breach of this paragraph 25 by the **Service Provider** shall be deemed a material breach of all and any relevant **Response Contracts** for the purposes of paragraph 14.1.

26. Notices

26.1 Save to the extent the manner of communication between the **Parties** is otherwise stipulated in these **Response Service Terms**, paragraph 17 of the prevailing **Common Flexibility Service Terms and Conditions** shall apply to any notice required to be submitted under these **Response Service Terms** by either **NGESO** or the **Registered Response Participant** to the other as if set out in full herein.

26.2 For the purposes of paragraph 26.1, the relevant contact details and addresses of each **Party** shall be those notified from time to time by that **Party** to the other pursuant to the **Registration and Pre-Qualification Procedure**.

27. Dispute Resolution

27.1 The provisions of paragraph 18 of the prevailing **Common Flexibility Service Terms and Conditions** shall apply in relation to any dispute or difference of whatever nature however arising under, out of, or in connection with these **Response Service Terms** as if set out in full herein, save that:-

- i. no **Party** shall have any right to refer any dispute to an **Expert** for determination except where the dispute is stated in these **Response Service Terms** to be referable to an **Expert** for determination or otherwise agreed in writing by the **Parties** to be so referable;
- ii. nothing in this paragraph 27.1 shall prevent the **Parties** from agreeing to resolve any dispute or difference through the courts in which case paragraph 28.2 shall apply; and
- iii. where any dispute is referred to arbitration, the rules of the Electricity Arbitration Association shall apply unless otherwise agreed in writing by the **Parties** (and paragraph 18 of the prevailing **Common Flexibility Service Terms and Conditions** shall be read and construed accordingly).

28. Governing Law and Jurisdiction

28.1 Any claim, dispute or matter (whether contractual or non-contractual) arising under or in connection with these **Response Service Terms** or their enforceability shall be governed by and construed in accordance with the laws of England and Wales.

28.2 Subject always to paragraph 27.1, **NGESO** and each **Registered Response Participant** submits to the exclusive jurisdiction of the courts of England and Wales over any claim, dispute or matter arising under or in connection with these **Response Service Terms** or their enforceability and waives any objection to proceedings being brought in such courts or on the grounds that proceedings have been brought in an inconvenient forum.

29. Severance

29.1 The provisions of paragraph 19 of the prevailing **Common Flexibility Service Terms and Conditions** shall apply as if set out in full herein.

30. Third Party Rights

30.1 The provisions of paragraph 20 of the prevailing **Common Flexibility Service Terms and Conditions** shall apply as if set out in full herein with the exception of the words “other than the Distribution and Transmission Licensees (the Company) who shall be entitled to independently enforce all of the terms of the Contract”.

31. No Agency or Partnership

31.1 The provisions of paragraph 21 of the prevailing **Common Flexibility Service Terms and Conditions** shall apply as if set out in full herein.

32. Waiver

32.1 The provisions of paragraph 22 of the prevailing **Common Flexibility Service Terms and Conditions** shall apply as if set out in full herein.

33. Entire Agreement

33.1 The provisions of paragraph 23 of the prevailing **Common Flexibility Service Terms and Conditions** shall apply as if set out in full herein.

34. EMR

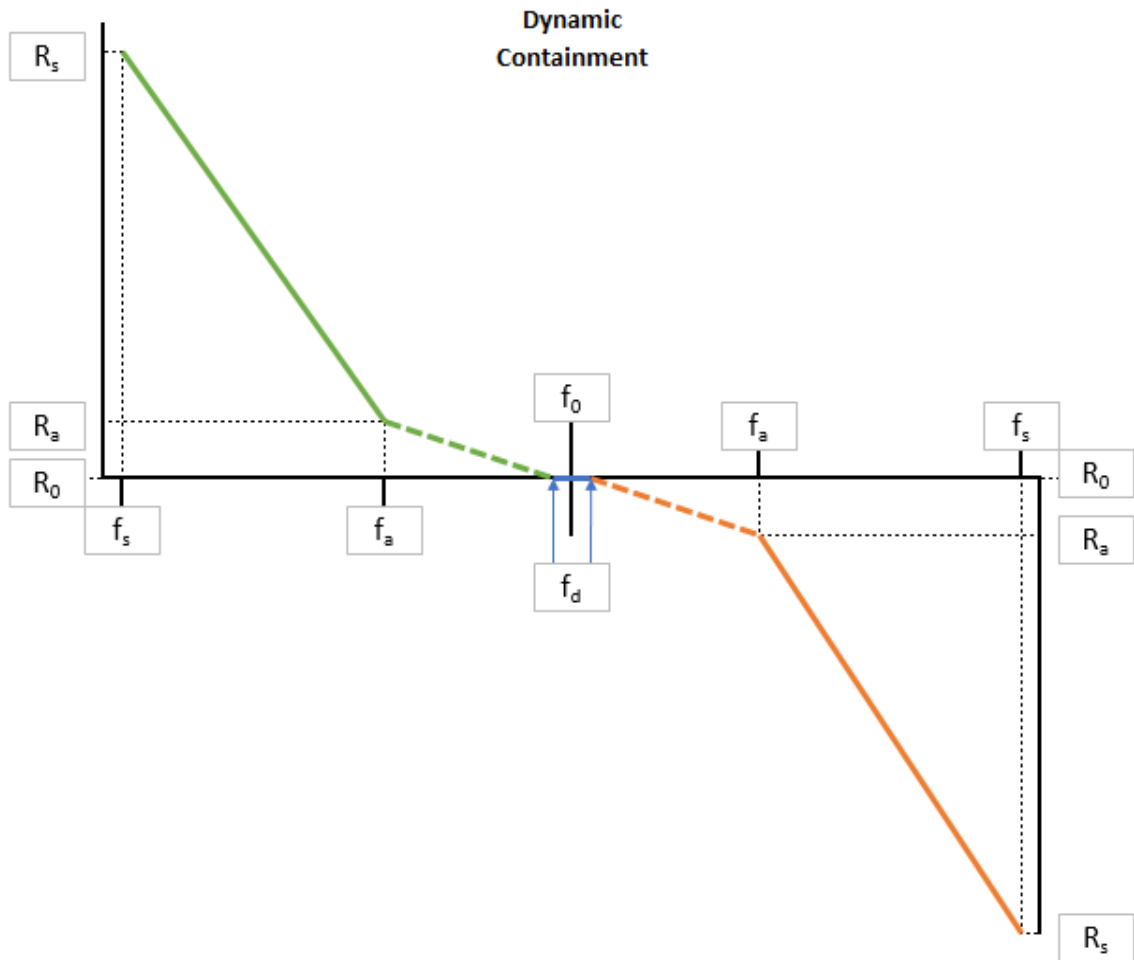
34.1 Notwithstanding any confidentiality obligations and any restriction on the use or disclosure of information set out in the **Response Procurement Documentation**, the **Services Provider** consents to **NGESO** and each of its subsidiaries using all and any information or data supplied to or acquired by it in any year under or in connection with any **Balancing Services Contract** for the purpose of carrying out its **EMR Functions**.

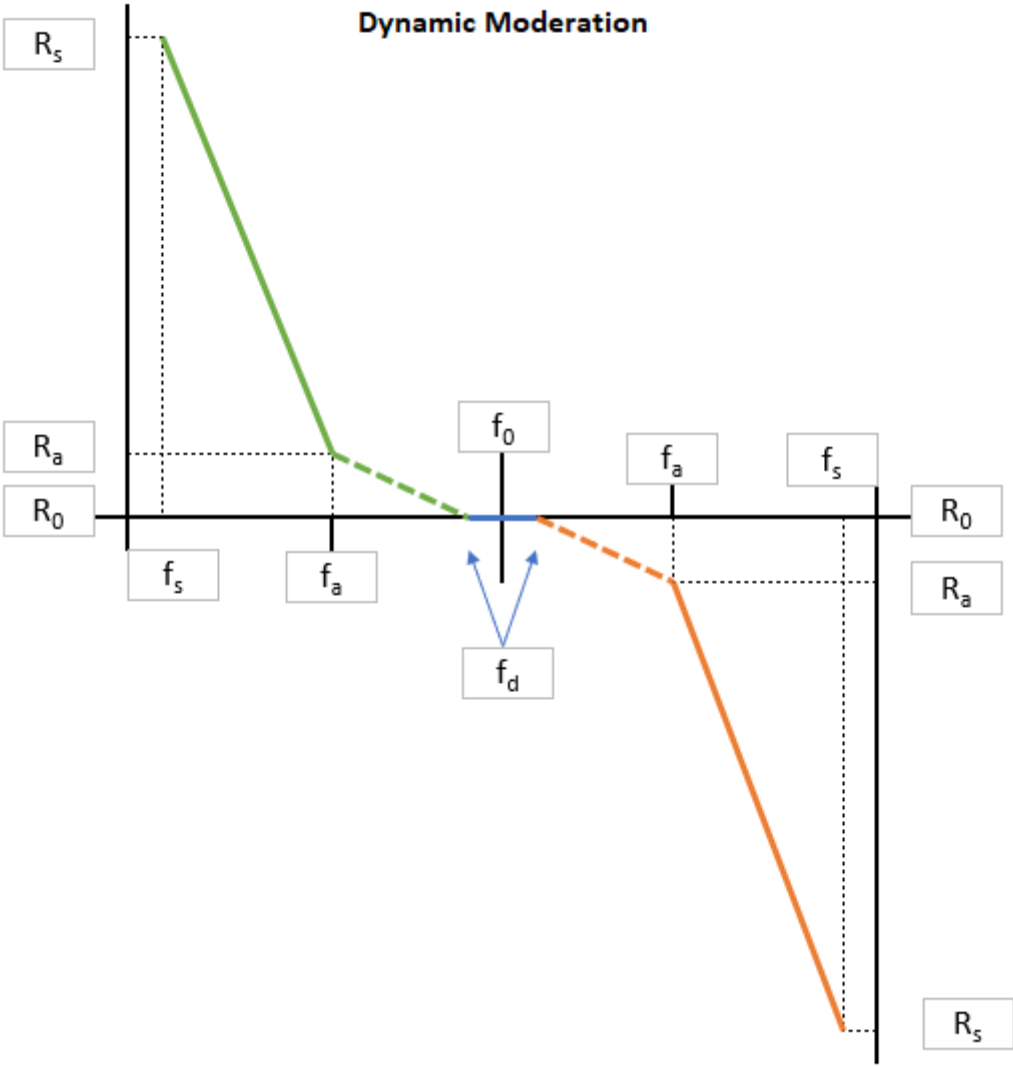
34.2 For the purposes of this paragraph 34 only:-

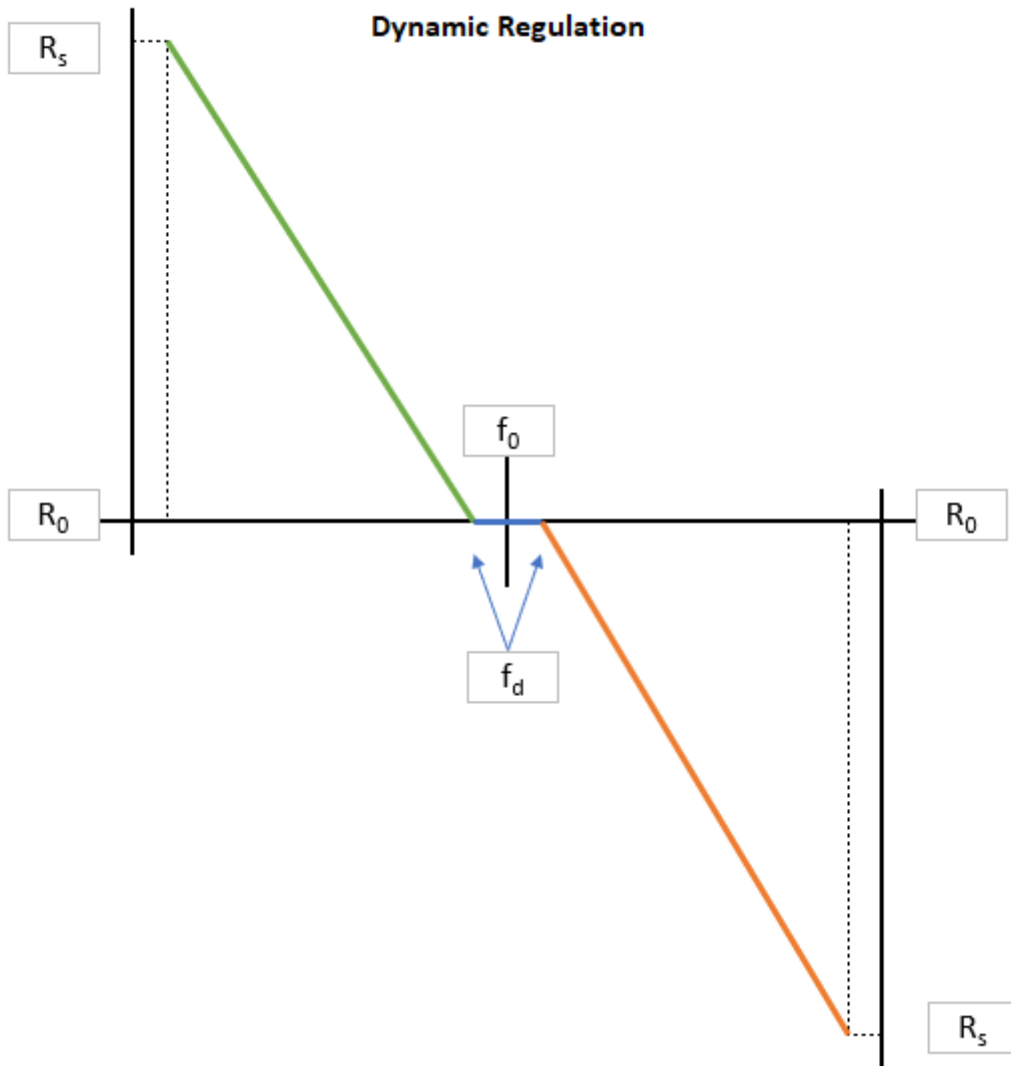
- i. **“AF Rules”** has the meaning given to “allocation framework” in section 13(2) of the Energy Act 2013;
- ii. **“Capacity Market Rules”** means the rules created pursuant to section 34 of the Energy Act 2013 as modified from time to time in accordance with The Electricity Capacity Regulations 2014;
- iii. **“EMR Functions”** has the meaning given to “EMR functions” in Chapter 5 of Part 2 of the Energy Act 2013; and
- iv. **“EMR Document”** means The Energy Act 2013, The Electricity Capacity Regulations 2014, the Capacity Market Rules, The Contracts for Difference (Allocation) Regulations 2014, The Contracts for Difference (Electricity Supplier Obligation) Regulations 2014, The Contracts for Difference (Definition of Eligible Generator) Regulations 2014, The Electricity Market Reform (General) Regulations 2014, the AF Rules and any other regulations or instruments made under Chapter 2

(contracts for difference), Chapter 3 (capacity market) or Chapter 4 (investment contracts) of Part 2 of the Energy Act 2013 which are in force from time to time.

SCHEDULE 1 - CAPABILITY DATA TABLES







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 **Response Procurement Documentation**, the former shall prevail.

Parameter	Description	I.D	Value (possible range)			Comment
			DC	DM	DR	
Frequency & delivery quantity parameters						

Parameter	Description	I.D	Value (possible range)			Comment
			DC	DM	DR	
Nominal frequency	Statutory system frequency for GB	f_n	50 Hz	50 Hz	50 Hz	
Target frequency	System frequency that NGESO aims to achieve	f_0	50 Hz	50 Hz	50 Hz	
Dead-band frequency range	Frequency range over which the service does not deliver	f_d	$f_0 - 0.015\text{Hz}$ to $f_0 + 0.015\text{Hz}$	$f_0 - 0.015\text{Hz}$ to $f_0 + 0.015\text{Hz}$	$f_0 - 0.015\text{Hz}$ to $f_0 + 0.015\text{Hz}$	This has been specified to align with Article 154, Annex 5 of the System Operator Guidelines (as converted into Retained EU Law). Active power delivery will commence at f_d
Knee-point frequency	Frequency set point which defines the beginning of the delivery curve	f_a	$f_n \pm 0.2 \text{ Hz}$	$f_n \pm 0.1 \text{ Hz}$	not applicable	The knee point describes where delivery of the service begins.
Full delivery frequency (saturation)	Frequency set point at which the service must deliver full contracted quantity ($Q_{\text{contract}}(h,l)$)	f_s	$f_n \pm 0.5 \text{ Hz}$	$f_n \pm 0.2 \text{ Hz}$	$f_n \pm 0.2 \text{ Hz}$	At this frequency set point the service must deliver the full contracted quantity.
Quantity at target and deadband	The percentage amount of Q_{contract} to be delivered at f_0 and f_d	R_0	0 %	0 %	0 %	
Quantity at knee-point	The percentage amount of Q_{contract} to be delivered at f_a	R_a	5%	5%	not applicable	The delivery profile is linear between f_d and f_a
Quantity at saturation	The percentage amount of Q_{contract} to be delivered at f_s	R_s	100 %	100 %	100 %	At the full delivery frequency the service must deliver 100 % of the contracted quantity.
Contract quantity parameters						
Contracted quantity	The amount of service that a	$Q_{\text{contract}}(h,l)$	Min 1MW	Min 1MW	Min 1MW	h refers to contracted quantity for high

Parameter	Description	I.D	Value (possible range)			Comment
			DC	DM	DR	
	provider is contracted to deliver. Can be either high or low frequency, or both.					frequency service. I refers to contracted quantity for low service. This is the Contracted Quantity
Contracted LF quantity	The quantity of LF service that a provider is contracted to deliver	P	Min 1MW	Min 1MW	Min 1MW	Is equivalent to $Q_{contract(l)}$
Contracted HF quantity	The quantity of HF service that a provider is contracted to deliver	Q	Min 1MW	Min 1MW	Min 1MW	Is equivalent to $Q_{contract(h)}$
Energy limited parameters						
Delivery duration	Time that an energy limited provider must be capable of sustained delivery of $Q_{contract(h,l)}$	T_{sus}	15 minutes	30 minutes	60 minutes	
Response energy volume	The volume of stored energy required to be delivered before State of Energy management is required to avoid unavailability	$V_{maxC(h,l)}$	$= (T_{sus} / 60) \times Q_{contract} \text{ MWh}$	$= (T_{sus} / 60) \times Q_{contract} \text{ MWh}$	$= (T_{sus} / 60) \times Q_{contract} \text{ MWh}$	This is NOT the maximum energy volume that could be delivered over the duration of a Contracted EFA Block .
Energy recovery	The minimum volume of energy recovery possible (by submission of Operational Baseline) in a single settlement period. As a percentage of $V_{maxC(h,l)}$	$V_{rec(h,l)}$	20%	20%	20%	Applicable only to energy limited providers. This equates to 3 minutes of energy when T_{sus} is 15 minutes.
Response delivery parameters						

Parameter	Description	I.D	Value (possible range)			Comment
			DC	DM	DR	
Max initiation time	The maximum time between a change in frequency and change in the delivery of response	T_{iMAX}	0.5 s	0.5 s	2 s	The provider must begin their response to a change in frequency between 0 s and T_{iMAX} after the deviation occurred.
Max time to full delivery	The maximum time between frequency deviation occurring and delivery of the saturation quantity (R_s)	T_{dMAX}	1 s	1 s	10 s	For a change in frequency that requires a change in response from 0 to R_s , this is the maximum time it should take.
Ramp time upper bound	The upper time bound of start of delivery to delivery of full contracted quantity	tr_{max}	0.5 s	0.5 s	8 s	Equivalent to $(T_{dMAX} - T_{iMAX})$. 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.
Maximum ramp rate for Baselines	The maximum ramp rate per minute permitted at any point within a baseline submitted by an energy limited provider as a percentage of contracted quantity $Q_{contract}(h,l)$	$RR_{bp}(h,l)$	5% per minute	5% per minute	5% per minute	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.
Error tolerance for full payment	The response error up to and including where no performance payment penalties are applied.	A	0.03	0.03	0.05	For DC and DM, this is an error of 3% of contracted quantity. See Schedule 2.

Parameter	Description	I.D	Value (possible range)			Comment
			DC	DM	DR	
Error limit for zero payment	The response error at and above which performance payment penalties are 100%.	B	0.07	0.07	0.25	For DC and DM, this is an error of 7% of contracted quantity (with linear interpolation of penalties between 3% and 7%) See Schedule 2.

SCHEDULE 2 - AVAILABILITY PAYMENTS

Calculation of Settlement Value

A settlement value shall be established for each **Auction Product** in accordance with the following formula:

$$Si_e = \left(\sum_j^{CEB} \text{Round} (Pij_e \times Vij_e \times 0.5, 2) \times Fij_e \right) \times K_e$$

Where

- Si_e is the settlement value for the relevant **Auction 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**
- Pij_e is the applicable **Market Clearing Price**, in GBP/MW/h, attributable to **Settlement Period j** for the relevant **Contracted EFA Block e** and **Auction Product**
- Vij_e is the **Contracted Quantity** in megawatts, in respect of **Response Unit i** and **Settlement Period j**, for the relevant **Contracted EFA Block e**
- 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 1
- K_e is defined for each **Auction Product** in the remainder of this Schedule 2 below.

The performance monitoring scheme for each **Auction Product** 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 for each **Auction Product**, calculated using performance bounds to represent valid response delivery. Performance bounds are a pair of time series that enclose possible valid **Auction Product** 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 the applicable **Auction Product**.

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

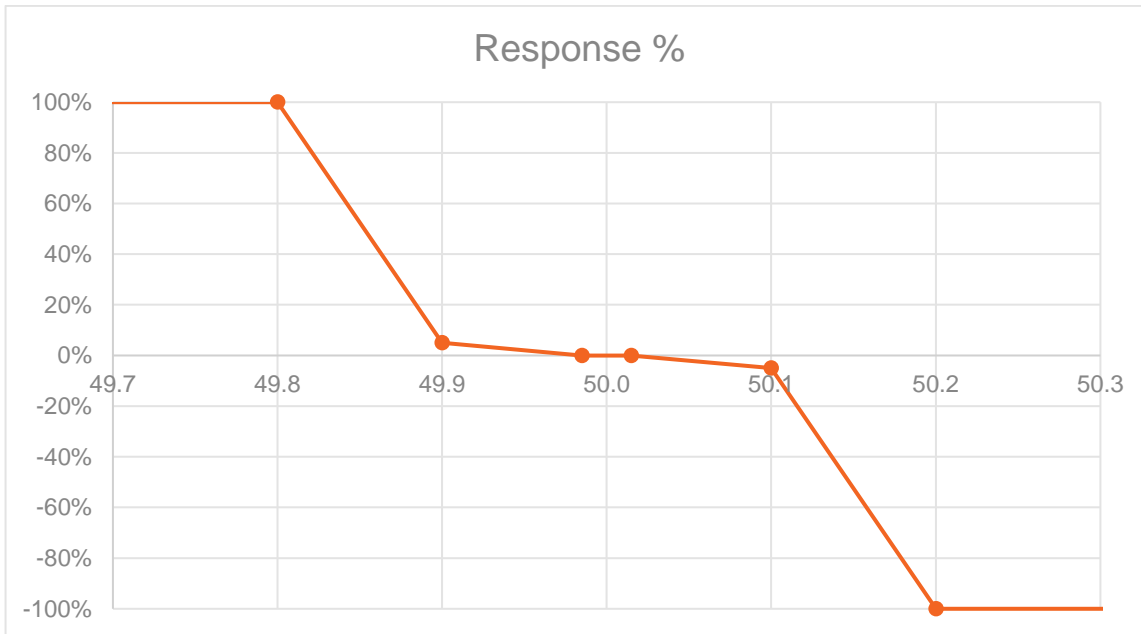
PART 1 - DETERMINATION OF K FACTOR: DYNAMIC MODERATION

Response Curve

The **Dynamic Moderation** response curve is defined as the linear interpolation between 6 pairs of frequency and response % delivery.

Saturation	$f_{S\pm} = f_0 \pm 0.2 \text{ Hz}$	$R_{S\pm} = \mp 100\%$
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Activation	$f_{A\pm} = f_0 \pm 0.1 \text{ Hz}$	$R_{A\pm} = \mp 5\%$
Delivery/deadband	$f_{D\pm} = f_0 \pm 0.015 \text{ Hz}$	$R_{D\pm} = 0\%$



$$R_{sym}(f) = \begin{cases} R_{S-} & : f < f_{S-} \\ R_{A-} + \frac{R_{S-} - R_{A-}}{f_{S-} - f_{A-}} \times (f - f_{A-}) & : f_{S-} \leq f < f_{A-} \\ \frac{R_{A-}}{f_{A-} - f_{D-}} \times (f - f_{D-}) & : f_{A-} \leq f < f_{D-} \\ 0 & : f_{D-} \leq f < f_{D+} \\ \frac{R_{A+}}{f_{A+} - f_{D+}} \times (f - f_{D+}) & : f_{D+} \leq f < f_{A+} \\ R_{A+} + \frac{R_{S+} - R_{A+}}{f_{S+} - f_{A+}} \times (f - f_{A+}) & : f_{A+} \leq f < f_{S+} \\ R_{S+} & : f_{S+} \leq f \end{cases}$$

These are the equations for LF and HF only moderation response curves.

$$R_{LF}(f) = \begin{cases} R_{S-} & : f < f_{S-} \\ R_{A-} + \frac{R_{S-} - R_{A-}}{f_{S-} - f_{A-}} \times (f - f_{A-}) & : f_{S-} \leq f < f_{A-} \\ \frac{R_{A-}}{f_{A-} - f_{D-}} \times (f - f_{D-}) & : f_{A-} \leq f < f_{D-} \\ 0 & : f_{D-} \leq f \end{cases}$$

$$R_{HF}(f) = \begin{cases} 0 & : f < f_{D+} \\ \frac{R_{A+}}{f_{A+} - f_{D+}} \times (f - f_{D+}) & : f_{D+} \leq f < f_{A+} \\ R_{A+} + \frac{R_{S+} - R_{A+}}{f_{S+} - f_{A+}} \times (f - f_{A+}) & : f_{A+} \leq f < f_{S+} \\ R_{S+} & : f_{S+} \leq f \end{cases}$$

Lags and ramp limits

Lag upper bound (maximum initiation time): $T_{iMAX} = 0.50 \text{ s}$

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

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

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

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 :

$$F^{upper}(t) = \max_{0 \leq t_{lag} \leq T_{iMAX} + tol_{iMAX}} f(t - t_{lag})$$

Lower frequency band at time t :

$$F^{lower}(t) = \min_{0 \leq t_{lag} \leq T_{iMAX} + tol_{iMAX}} f(t - t_{lag})$$

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

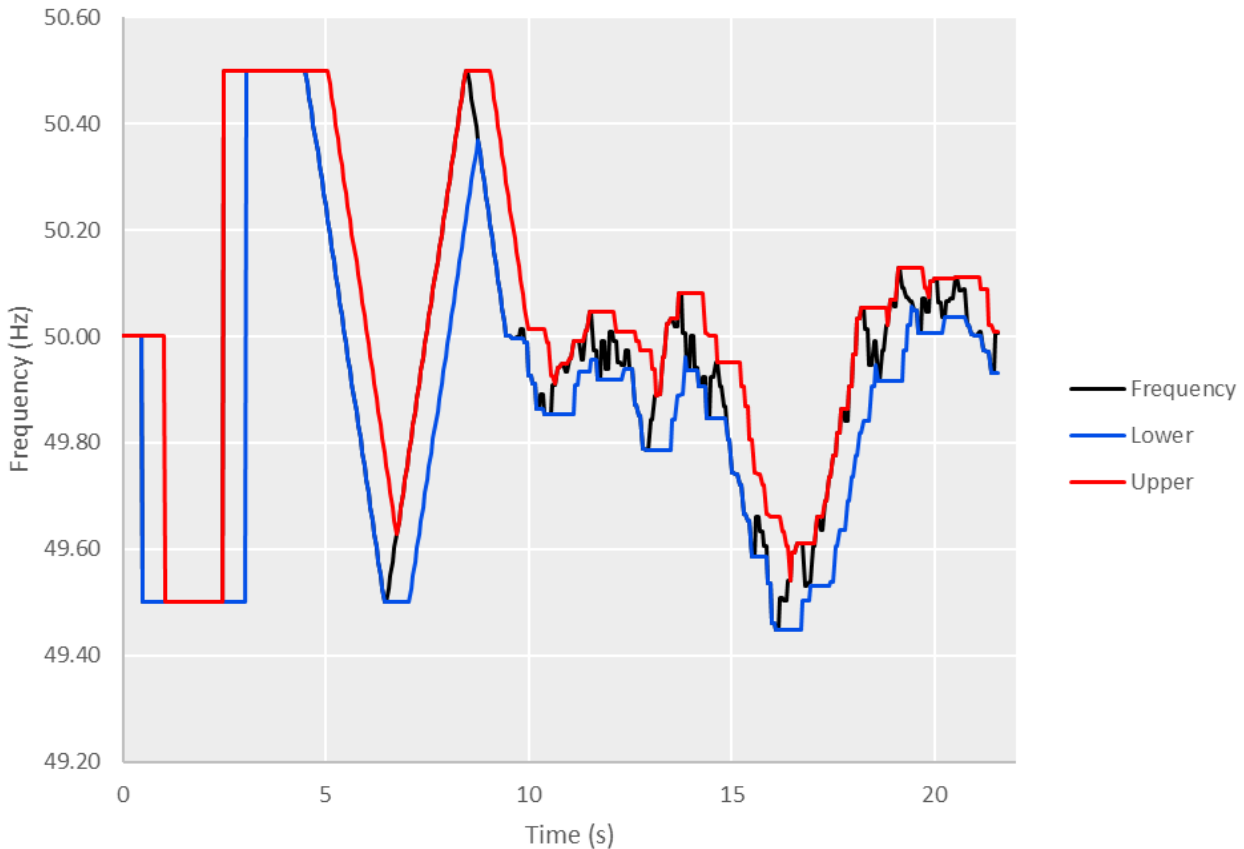


Figure 1: Example of frequency bounds calculation

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 ramp limit r :

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

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

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

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

Where $RLD_{prev} = RLD(R(t - \Delta t), r)$.

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**, the performance bounds will be calculated for **2 seconds** after the change using whichever of the contracts gives the lower bound, and the higher upper bound. The performance will be assumed to be 100% during such grace period provided that the scaled error is below 25%.

Performance bounds for LF only

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

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

Performance bounds for HF only

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

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

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:

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

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

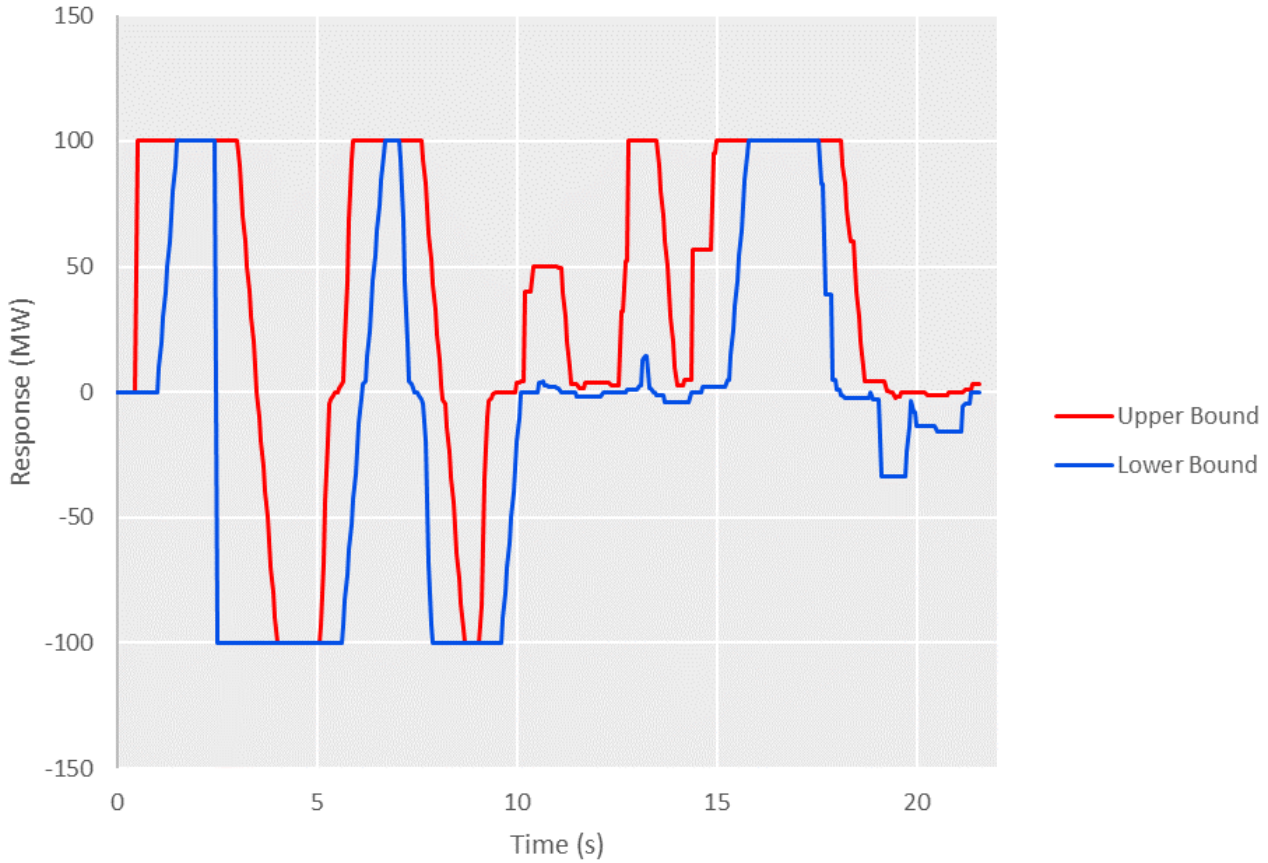


Figure 2: Example of symmetric performance bounds calculation using the frequency bounds from figure 1

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.

Error for LF-only

The LF error $e_{m_{LF}}$ for one time measurement and metered response R :

$$e_{m_{LF}} = \begin{cases} LB_{LF} - R & R < LB_{LF} \\ 0 & LB_{LF} \leq R \leq UB_{LF} \\ R - UB_{LF} & R > UB_{LF} \end{cases}$$

Scaled LF error $es_{m_{LF}}$ for one measurement:

$$es_{m_{LF}} = \frac{e_{m_{LF}}}{P}$$

LF Settlement Period error:

$$E_{LF} = \max_{m_{LF}} \left(\text{rolling_minimum}_{\text{over 0.2 seconds}} es_{m_{LF}} \right)$$

Error for HF-only

The HF error $e_{m_{HF}}$ for one time measurement and metered response R :

$$e_{m_{HF}} = \begin{cases} LB_{HF} - R & R < LB_{HF} \\ 0 & LB_{HF} \leq R \leq UB_{HF} \\ R - UB_{HF} & R > UB_{HF} \end{cases}$$

Scaled HF error $es_{m_{HF}}$ for one measurement:

$$es_{m_{HF}} = \frac{e_{m_{HF}}}{Q}$$

HF Settlement Period error:

$$E_{HF} = \max_{m_{HF}} \left(\text{rolling_minimum}_{\text{over 0.2 seconds}} es_{m_{HF}} \right)$$

Error for Bundled LF and HF

For bundled LF and HF service delivery, performance bounds are calculated using the **Performance bounds for LF and HF** equation resulting in lower bound (LB) and upper bound (UB). To segregate errors into LF and HF errors, the performance bounds are segregated into LF and HF bounds.

For LF errors of bundled service, the UB and LB are calculated as:

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

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

The LF error $e_{m_{LF}}$ for one time measurement and metered response R :

$$e_{m_{LF}} = \begin{cases} LB_{LF} - R & R < LB_{LF} \\ 0 & LB_{LF} \leq R \leq UB_{LF} \\ R - UB_{LF} & R > UB_{LF} \end{cases}$$

Scaled LF error $es_{m_{LF}}$ for one measurement:

$$es_{m_{LF}} = \frac{e_{m_{LF}}}{P}$$

LF Settlement Period error:

$$E_{LF} = \max_{m_{LF}} \left(\text{rolling_minimum}_{\text{over 0.2 seconds}} es_{m_{LF}} \right)$$

For HF errors of bundled service, the UB and LB are calculated as:

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

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

The HF error $e_{m_{HF}}$ for one time measurement and metered response R :

$$e_{m_{HF}} = \begin{cases} LB_{HF} - R & R < LB_{HF} \\ 0 & LB_{HF} \leq R \leq UB_{HF} \\ R - UB_{HF} & R > UB_{HF} \end{cases}$$

Scaled HF error $es_{m_{HF}}$ for one measurement:

$$es_{m_{HF}} = \frac{e_{m_{HF}}}{Q}$$

HF Settlement Period error:

$$E_{HF} = \max_{m_{HF}} \left(\text{rolling_minimum}_{\text{over 0.2 seconds}} es_{m_{HF}} \right)$$

K factor calculation

The **Settlement Period** error is used to derive a k factor for each **Settlement Period** of the corresponding **Auction Product**.

Settlement period k factor calculation for LF

For **Settlement Period** j , the Settlement period k factor for LF is:

$$k_{j_LF} = \begin{cases} 1 & E < A \\ 1 - (E_{LF} - A)/(B - A) & A \leq E_{LF} \leq B \\ 0 & E > B \end{cases}$$

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

Settlement period k factor calculation for HF

For **Settlement Period** j , the Settlement period k factor for HF is:

$$k_{j_HF} = \begin{cases} 1 & E < A \\ 1 - (E_{HF} - A)/(B - A) & A \leq E_{HF} \leq B \\ 0 & E > B \end{cases}$$

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

K factor for the Contracted EFA Block

The K factor for the **Contracted EFA Block** of the corresponding **Auction Product** is then,

K factor for LF:

$$K_e = \min_{j_LF} k_{j_LF}$$

K factor for HF:

$$K_e = \min_{j_HF} k_{j_HF}$$

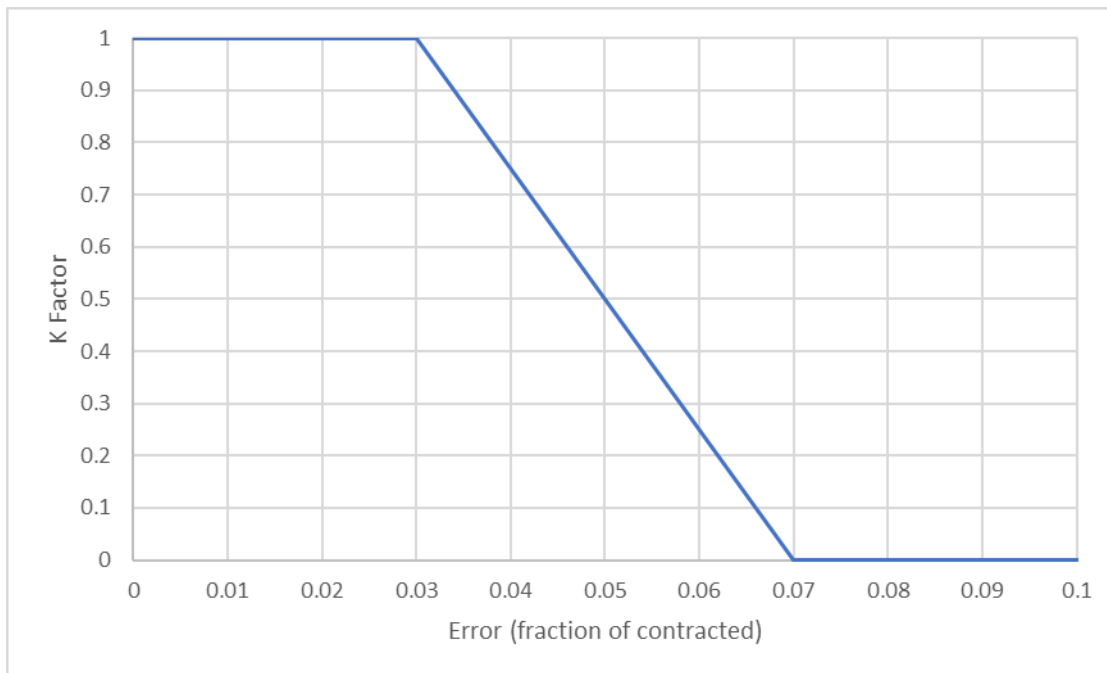


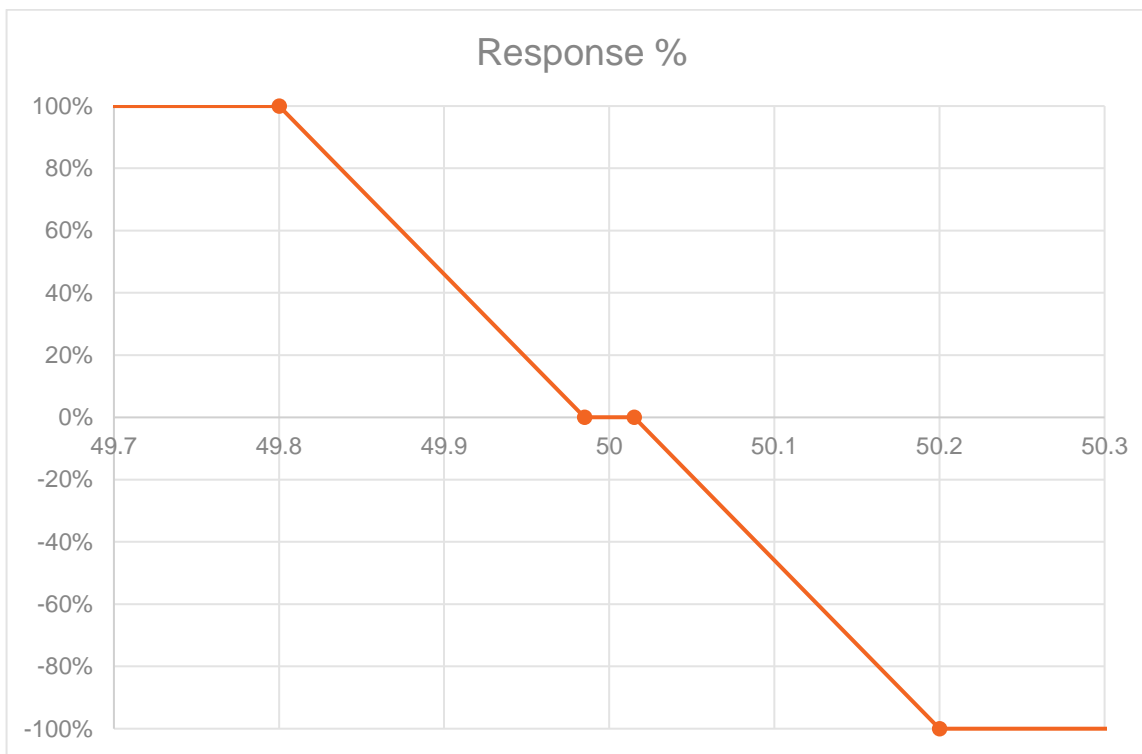
Figure 3: Payment adjustment (K factor) curve

PART 2 - DETERMINATION OF K FACTOR: DYNAMIC REGULATION

Response Curve

The **Dynamic Regulation** response curve is defined as the linear interpolation between 4 pairs of frequency and response % delivery. The requirement not to deviate from **Operational Baseline** within the “deadband” should be read subject to paragraph 6.11vi

Saturation	$f_{S\pm} = f_0 \pm 0.2 \text{ Hz}$	$R_{S\pm} = \mp 100\%$
Delivery/deadband	$f_{D\pm} = f_0 \pm 0.015 \text{ Hz}$	$R_{D\pm} = 0\%$



$$R_{Sym}(f) = \begin{cases} R_{S-} & : f < f_{S-} \\ \frac{R_{S-}}{f_{S-} - f_{D-}} \times (f - f_{D-}) & : f_{S-} \leq f < f_{D-} \\ 0 & : f_{D-} \leq f < f_{D+} \\ \frac{R_{S+}}{f_{S+} - f_{D+}} \times (f - f_{D+}) & : f_{D+} \leq f < f_{S+} \\ R_{S+} & : f_{S+} \leq f \end{cases}$$

These are the equations for LF and HF only regulation response curves.

$$R_{LF}(f) = \begin{cases} R_{S-} & : f < f_{S-} \\ \frac{R_{S-}}{f_{S-} - f_{D-}} \times (f - f_{D-}) & : f_{S-} \leq f < f_{D-} \\ 0 & : f_{D-} \leq f \end{cases}$$

$$R_{HF}(f) = \begin{cases} 0 & : f < f_{D+} \\ \frac{R_{S+}}{f_{S+} - f_{D+}} \times (f - f_{D+}) & : f_{D+} \leq f < f_{S+} \\ R_{S+} & : f_{S+} \leq f \end{cases}$$

Lags and ramp limits

Lag upper bound (maximum initiation time): $T_{iMAX} = 2 \text{ s}$

Ramp time upper bound: $tr_{max} = T_{dMAX} - T_{iMAX} = 8 \text{ s}$

Ramp rate (proportional) lower bound: $rr_{min} = \frac{1}{tr_{max}} = 0.125 \text{ s}^{-1}$

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 :

$$F^{upper}(t) = \max_{0 \leq t_{lag} \leq T_{iMAX}} f(t - t_{lag})$$

Lower frequency band at time t :

$$F^{lower}(t) = \min_{0 \leq t_{lag} \leq T_{iMAX}} f(t - t_{lag})$$

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

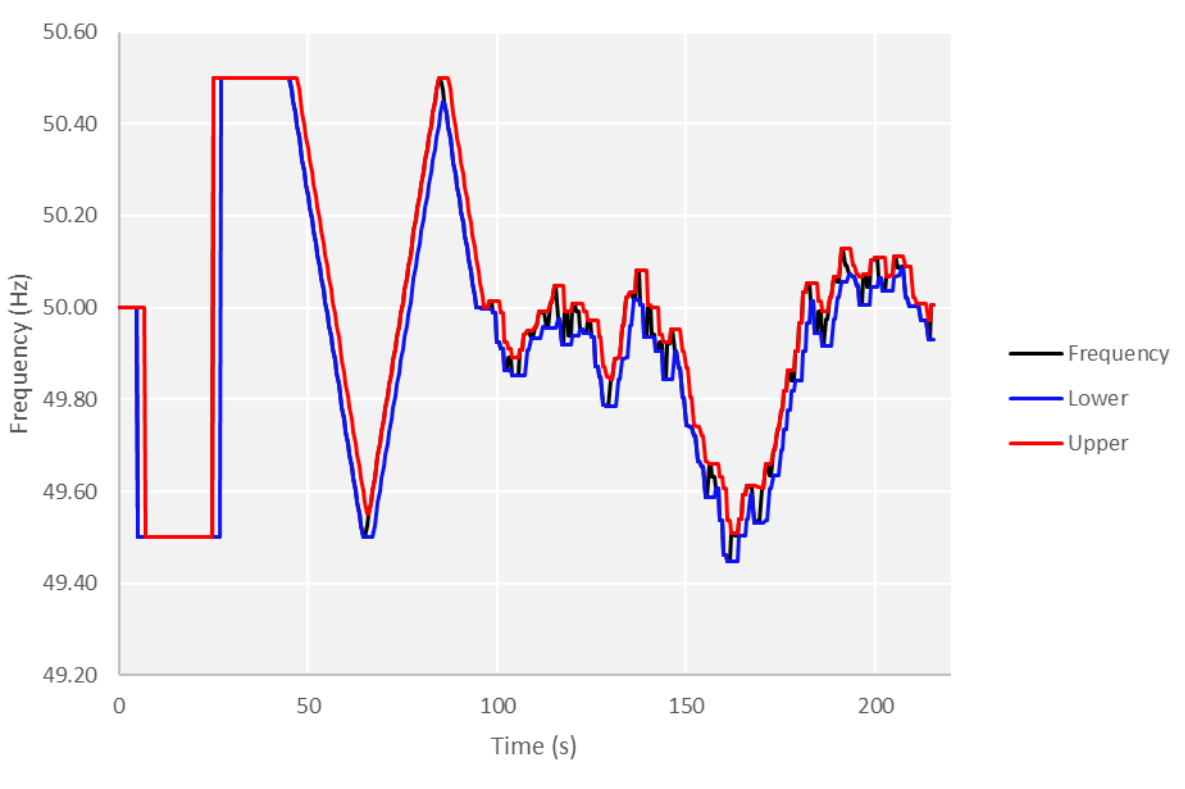


Figure 1: Example of frequency bounds calculation

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 ramp limit r :

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

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

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

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

Where $RLD_{prev} = RLD(R(t - \Delta t), r)$.

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 2 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**, the performance bounds will be calculated for **10 seconds** after the change using whichever of the contracts gives the lower bound, and the higher upper bound. The performance will be assumed to be 100% during such grace period provided that the scaled error is below 25%.

Performance bounds for LF only

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

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

Performance bounds for HF only

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

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

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:

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

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

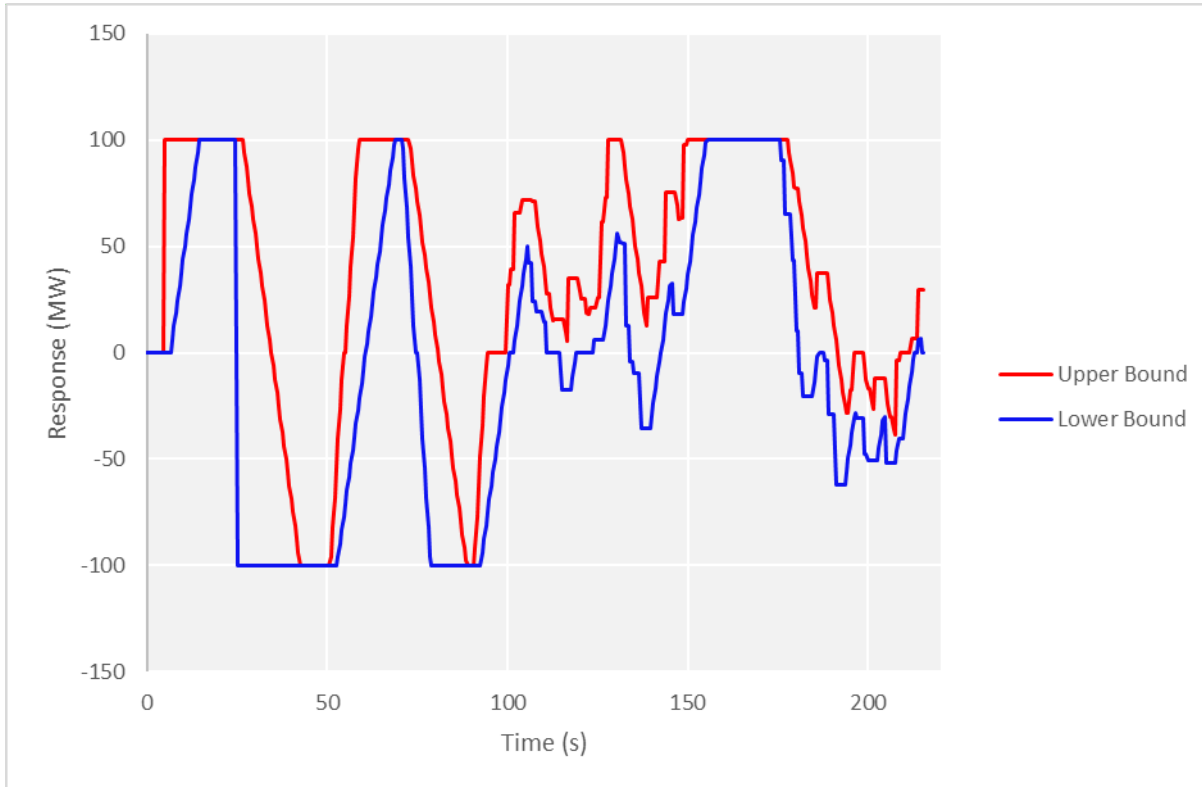


Figure 2: Example of symmetric performance bounds calculation using the frequency bounds from figure 1

Error calculation

The performance monitoring error is zero if the metered response is between the upper and lower performance bounds and (subject as provided below) is otherwise the difference between the metered response and the closer of the performance bounds.

The performance monitoring error is also zero if the metered response falls between the saturation and the extended response slope when it should be saturated but frequency further deviates from +/- 0.2Hz.

Error for LF only

The LF error $e_{m_{LF}}$ for one time measurement and metered response R :

$$e_{m_{LF}} = \begin{cases} LB_{LF} - R & R < LB_{LF} \\ 0 & LB_{LF} \leq R \leq UB_{LF} \\ R - UB_{LF} & R > UB_{LF} \end{cases}$$

Scaled LF error $es_{m_{LF}}$ for one measurement:

$$es_{m_{LF}} = \frac{e_{m_{LF}}}{P}$$

LF Settlement Period error:

$$E_{LF} = \max_{m_{LF}} \left(\text{rolling_minimum}_{\text{over 0.2 seconds}} es_{m_{LF}} \right)$$

Error for HF only

The HF error $e_{m_{HF}}$ for one time measurement and metered response R :

$$e_{m_{HF}} = \begin{cases} LB_{HF} - R & R < LB_{HF} \\ 0 & LB_{HF} \leq R \leq UB_{HF} \\ R - UB_{HF} & R > UB_{HF} \end{cases}$$

Scaled HF error $eS_{m_{HF}}$ for one measurement:

$$eS_{m_{HF}} = \frac{e_{m_{HF}}}{Q}$$

HF Settlement Period error:

$$E_{HF} = \max_{m_{HF}} \left(\text{rolling_minimum}_{\text{over 0.2 seconds}} eS_{m_{HF}} \right)$$

Error for Bundled LF and HF

For bundled LF and HF service delivery, performance bounds are calculated using the **Performance bounds for LF and HF** equation resulting in lower bound (LB) and upper bound (UB). To segregate errors into LF and HF errors, the performance bounds are segregated into LF and HF bounds.

For LF errors of bundled service, the UB and LB are calculated as:

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

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

The LF error $e_{m_{LF}}$ for one time measurement and metered response R :

$$e_{m_{LF}} = \begin{cases} LB_{LF} - R & R < LB_{LF} \\ 0 & LB_{LF} \leq R \leq UB_{LF} \\ R - UB_{LF} & R > UB_{LF} \end{cases}$$

Scaled LF error $eS_{m_{LF}}$ for one measurement:

$$eS_{m_{LF}} = \frac{e_{m_{LF}}}{P}$$

LF Settlement Period error:

$$E_{LF} = \max_{m_{LF}} \left(\text{rolling_minimum}_{\text{over 0.2 seconds}} eS_{m_{LF}} \right)$$

For HF errors of bundled service, the UB and LB are calculated as:

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

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

The HF error $e_{m_{HF}}$ for one time measurement and metered response R :

$$e_{m_{HF}} = \begin{cases} LB_{HF} - R & R < LB_{HF} \\ 0 & LB_{HF} \leq R \leq UB_{HF} \\ R - UB_{HF} & R > UB_{HF} \end{cases}$$

Scaled HF error $eS_{m_{HF}}$ for one measurement:

$$eS_{m_{HF}} = \frac{e_{m_{HF}}}{Q}$$

HF Settlement Period error:

$$E_{HF} = \max_{m_{HF}} \left(\text{rolling_minimum}_{\text{over 0.2 seconds}} eS_{m_{HF}} \right)$$

K factor calculation

The **Settlement Period** error is used to derive a k factor for each **Settlement Period** of the corresponding **Auction Product**.

Settlement period k factor calculation for LF

For **Settlement Period** j , the Settlement period k factor for LF is:

$$k_{j_LF} = \begin{cases} 1 & E < A \\ 1 - (E_{LF} - A)/(B - A) & A \leq E_{LF} \leq B \\ 0 & E > B \end{cases}$$

Where $A = 0.05$ and $B = 0.25$

Settlement period k factor calculation for HF

For **Settlement Period** j , the Settlement period k factor for HF is:

$$k_{j_HF} = \begin{cases} 1 & E < A \\ 1 - (E_{HF} - A)/(B - A) & A \leq E_{HF} \leq B \\ 0 & E > B \end{cases}$$

Where $A = 0.05$ and $B = 0.25$

K factor for the Contracted EFA Block

The K factor for the **Contracted EFA Block** of the corresponding **Auction Product** is then,

K factor for LF:

$$K_e = \min_{j_LF} k_{j_LF}$$

K factor for HF:

$$K_e = \min_{j_HF} k_{j_HF}$$

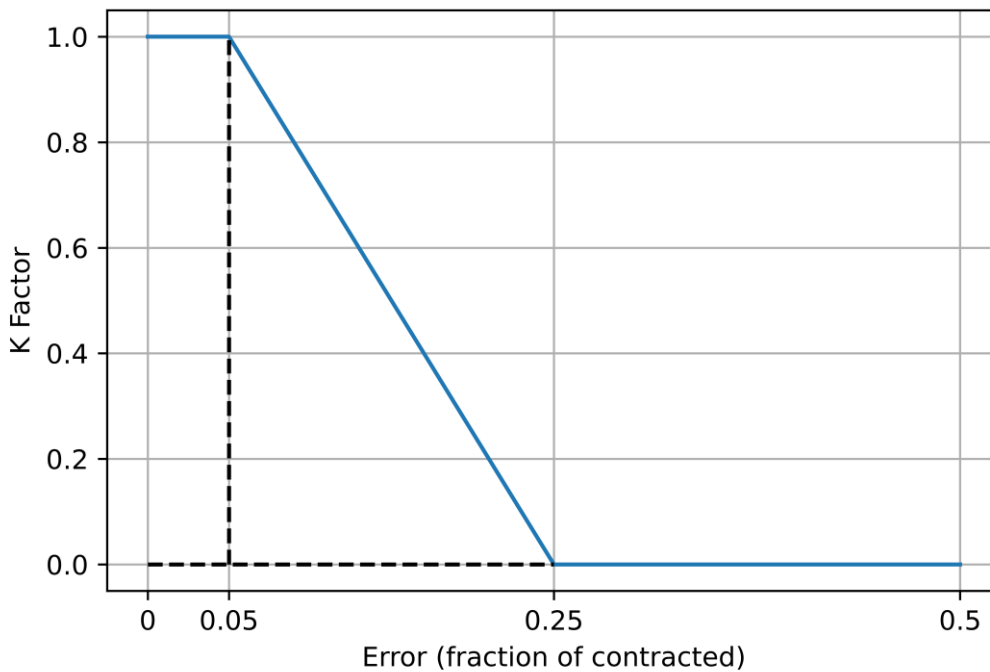


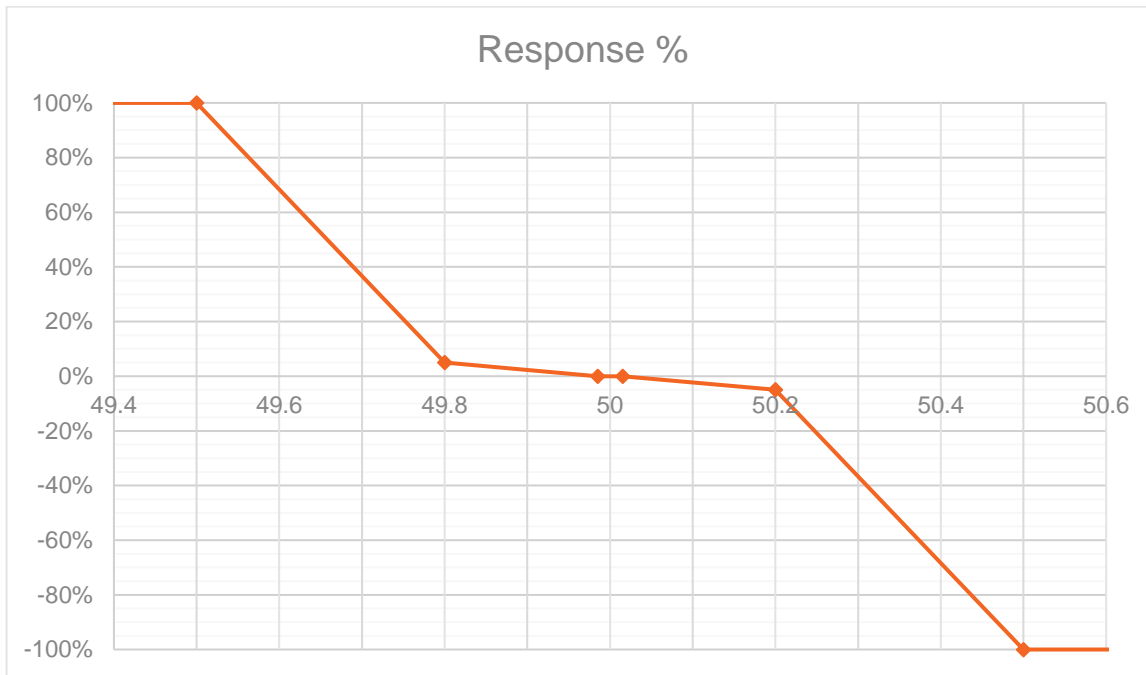
Figure 3: Payment adjustment (K factor) curve

PART 3 - DETERMINATION OF K FACTOR: DYNAMIC CONTAINMENT

Response Curve

The **Dynamic Containment** response curve is defined as the linear interpolation between 6 pairs of frequency and response % delivery.

Saturation	$f_{S\pm} = f_0 \pm 0.5 \text{ Hz}$	$R_{S\pm} = \mp 100\%$
Activation	$f_{A\pm} = f_0 \pm 0.2 \text{ Hz}$	$R_{A\pm} = \mp 5\%$
Delivery/deadband	$f_{D\pm} = f_0 \pm 0.015 \text{ Hz}$	$R_{D\pm} = 0\%$



$$R_{sym}(f) = \begin{cases} R_{S-} & : f < f_{S-} \\ R_{A-} + \frac{R_{S-} - R_{A-}}{f_{S-} - f_{A-}} \times (f - f_{A-}) & : f_{S-} \leq f < f_{A-} \\ \frac{R_{A-}}{f_{A-} - f_{D-}} \times (f - f_{D-}) & : f_{A-} \leq f < f_{D-} \\ 0 & : f_{D-} \leq f < f_{D+} \\ \frac{R_{A+}}{f_{A+} - f_{D+}} \times (f - f_{D+}) & : f_{D+} \leq f < f_{A+} \\ R_{A+} + \frac{R_{S+} - R_{A+}}{f_{S+} - f_{A+}} \times (f - f_{A+}) & : f_{A+} \leq f < f_{S+} \\ R_{S+} & : f_{S+} \leq f \end{cases}$$

These are the equations for LF and HF only containment response curves.

$$R_{LF}(f) = \begin{cases} R_{S-} & : f < f_{S-} \\ R_{A-} + \frac{R_{S-} - R_{A-}}{f_{S-} - f_{A-}} \times (f - f_{A-}) & : f_{S-} \leq f < f_{A-} \\ \frac{R_{A-}}{f_{A-} - f_{D-}} \times (f - f_{D-}) & : f_{A-} \leq f < f_{D-} \\ 0 & : f_{D-} \leq f \end{cases}$$

$$R_{HF}(f) = \begin{cases} 0 & : f < f_{D+} \\ \frac{R_{A+}}{f_{A+} - f_{D+}} \times (f - f_{D+}) & : f_{D+} \leq f < f_{A+} \\ R_{A+} + \frac{R_{S+} - R_{A+}}{f_{S+} - f_{A+}} \times (f - f_{A+}) & : f_{A+} \leq f < f_{S+} \\ R_{S+} & : f_{S+} \leq f \end{cases}$$

Lags and ramp limits

Lag upper bound (maximum initiation time): $T_{iMAX} = 0.50 \text{ s}$

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

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

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

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 :

$$F^{upper}(t) = \max_{0 \leq t_{lag} \leq T_{iMAX} + tol_{iMAX}} f(t - t_{lag})$$

Lower frequency band at time t :

$$F^{lower}(t) = \min_{0 \leq t_{lag} \leq T_{iMAX} + tol_{iMAX}} f(t - t_{lag})$$

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

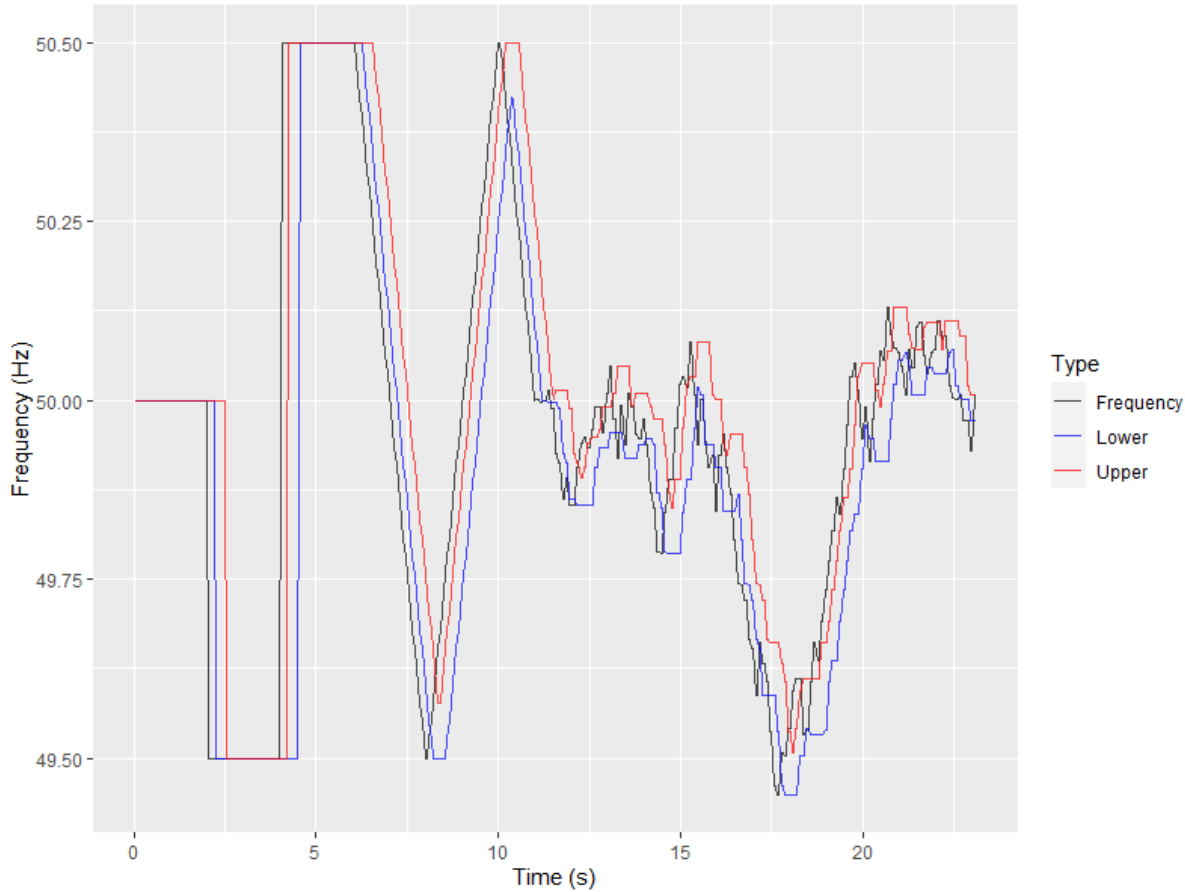


Figure 1: Example of frequency bounds calculation

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 :

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

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

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

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

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**, the performance bounds will be calculated for **2 seconds** after the change using whichever of the contracts gives the lower bound, and the higher upper bound. The performance will be assumed to be 100% during such grace period provided that the scaled error is below 25%.

Performance bounds for LF only

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

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

Performance bounds for HF only

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

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

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:

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

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

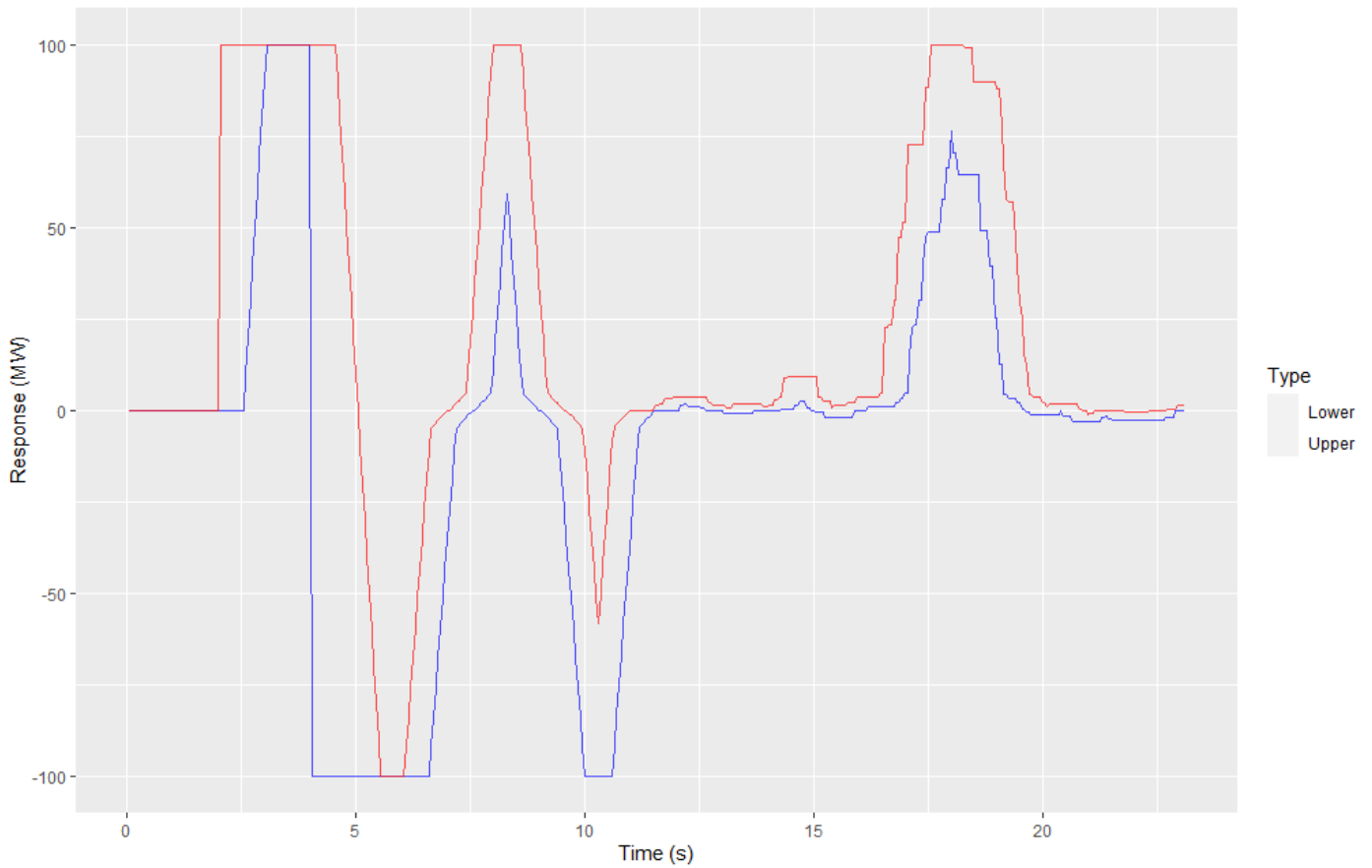


Figure 2: Example of symmetric performance bounds calculation using the frequency bounds from figure 1

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.

Error for LF only

The LF error e_{m_LF} for one time measurement and metered response R :

$$e_{m_LF} = \begin{cases} LB_{LF} - R & R < LB_{LF} \\ 0 & LB_{LF} \leq R \leq UB_{LF} \\ R - UB_{LF} & R > UB_{LF} \end{cases}$$

Scaled LF error es_{m_LF} for one measurement:

$$es_{m_LF} = \frac{e_{m_LF}}{P}$$

LF Settlement Period error:

$$E_{LF} = \max_{m_LF} \left(\text{rolling_minimum}_{\text{over 0.2 seconds}} es_{m_LF} \right)$$

Error for HF only

The HF error e_{m_HF} for one time measurement and metered response R :

$$e_{m_HF} = \begin{cases} LB_{HF} - R & R < LB_{HF} \\ 0 & LB_{HF} \leq R \leq UB_{HF} \\ R - UB_{HF} & R > UB_{HF} \end{cases}$$

Scaled HF error es_{m_HF} for one measurement:

$$eS_{m_HF} = \frac{e_{m_HF}}{Q}$$

HF Settlement Period error:

$$E_{HF} = \max_{m_HF} \left(\text{rolling_minimum}_{\text{over 0.2 seconds}} eS_{m_HF} \right)$$

Error for Bundled LF and HF

For bundled LF and HF service delivery, performance bounds are calculated using the **Performance bounds for LF and HF** equation resulting in lower bound (LB) and upper bound (UB). To segregate errors into LF and HF errors, the performance bounds are segregated into LF and HF bounds.

For LF errors of bundled service, the UB and LB are calculated as:

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

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

The LF error e_{m_LF} for one time measurement and metered response R :

$$e_{m_LF} = \begin{cases} LB_{LF} - R & R < LB_{LF} \\ 0 & LB_{LF} \leq R \leq UB_{LF} \\ R - UB_{LF} & R > UB_{LF} \end{cases}$$

Scaled LF error eS_{m_LF} for one measurement:

$$eS_{m_LF} = \frac{e_{m_LF}}{P}$$

LF Settlement Period error:

$$E_{LF} = \max_{m_LF} \left(\text{rolling_minimum}_{\text{over 0.2 seconds}} eS_{m_LF} \right)$$

For HF errors of bundled service, the UB and LB are calculated as:

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

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

The HF error e_{m_HF} for one time measurement and metered response R :

$$e_{m_HF} = \begin{cases} LB_{HF} - R & R < LB_{HF} \\ 0 & LB_{HF} \leq R \leq UB_{HF} \\ R - UB_{HF} & R > UB_{HF} \end{cases}$$

Scaled HF error eS_{m_HF} for one measurement:

$$eS_{m_HF} = \frac{e_{m_HF}}{Q}$$

HF Settlement Period error:

$$E_{HF} = \max_{m_HF} \left(\text{rolling_minimum}_{\text{over 0.2 seconds}} eS_{m_HF} \right)$$

K factor calculation

The **Settlement Period** error is used to derive a k factor for each **Settlement Period** of the corresponding **Auction Product**.

Settlement period k factor calculation for LF

For **Settlement Period** j , the Settlement period k factor for LF is:

$$k_{j_LF} = \begin{cases} 1 & E < A \\ 1 - (E_{LF} - A)/(B - A) & A \leq E_{LF} \leq B \\ 0 & E > B \end{cases}$$

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

Settlement period k factor calculation for HF

For **Settlement Period** j , the Settlement period k factor for HF is:

$$k_{j_HF} = \begin{cases} 1 & E < A \\ 1 - (E_{HF} - A)/(B - A) & A \leq E_{HF} \leq B \\ 0 & E > B \end{cases}$$

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

K factor for the Contracted EFA Block

The K factor for the **Contracted EFA Block** of the corresponding **Auction Product** is then,

K factor for LF:

$$K_e = \min_{j_LF} k_{j_LF}$$

K factor for HF:

$$K_e = \min_{j_HF} k_{j_HF}$$



Figure 3: Payment adjustment (K factor) curve

SCHEDULE 3 - PAYMENT PROVISIONS

Where amounts falling due by or to **NGESO** under these **Response Service Terms** are expressed to be payable in accordance with this Schedule 3, then with respect to all and any such amounts the following provisions shall apply.

1. On the eighth (8th) **Business Day** of each calendar month **NGESO** shall send to the **Service Provider** a statement (the "**Monthly Statement**") setting out, for each **Response Contract**, details of the following (to the extent applicable) in respect of the preceding calendar month, together with such other information as may be required to be provided under the these **Response Service Terms**:
 - a. the aggregate number of hours of service provision, together with any **Applicable Balancing Services Volume Data**, with respect to both availability and utilisation (as applicable);
 - b. details of events of default or service failures, and any consequential amounts withheld by or payable to **NGESO** with respect thereof;
 - c. the amounts payable by or to **NGESO** as a result; and
 - d. in relation to all **Response Contracts**, the total net amount falling due to or from the **Service Provider**.
2. If the **Service Provider** disagrees with the content of any **Monthly Statement**, it may notify **NGESO** in writing, with evidence upon which it relies in support of such disagreement, no later than the date falling ten (10) **Business Days** after receipt thereof, but in the absence of any such notification by such date the **Monthly Statement** shall be final and binding on the **Parties** subject only to paragraph 4.
3. Where a disagreement is notified by the **Service Provider** pursuant to paragraph 2, the **Parties** shall discuss and endeavour to resolve the same in good faith, and any revisions to a **Monthly Statement** agreed as a result thereof shall be reflected in a revised **Monthly Statement**, which shall promptly be issued by **NGESO**. In the absence of agreement, the **Monthly Statement** shall be binding upon the **Parties** until such time as otherwise agreed in writing between the **Parties** or as may otherwise be determined by an **Expert** following a referral by either **Party** to an **Expert** for determination, and which in each case shall be reflected in a revised **Monthly Statement** which shall promptly be issued by **NGESO**.
4. Where, having regard to any **Settlement Run** or to the results of any other monitoring by **NGESO** of service delivery, **NGESO** or the **Service Provider** discovers that some or all of any calculations and/or amounts falling due shown in any **Monthly Statement** are incorrect, then it shall promptly notify the other in writing whereupon **NGESO** shall, at its discretion, revise the **Monthly Statement** and re-issue the same to the **Balancing Service Provider**, and the provisions of paragraphs 2 and 3 shall apply mutatis mutandis to such revised **Monthly Statement**.
5. In the absence of fraud, neither **NGESO** nor the **Balancing Service Provider** may invoke the provisions of paragraph 4, with respect to the contents of any **Monthly Statement** (including any revised **Monthly Statement**) after the period of twelve (12) months has elapsed following submission of the original **Monthly Statement** in which the calculations and/or amounts in question were first stated, after which date such calculations and/or amounts shown in the last **Monthly Statement** (including any revised **Monthly Statement**) issued by **NGESO** shall be final and conclusive.
6. No later than the eighteenth (18th) **Business Day** of each month, **NGESO** will issue a self-billing invoice (or credit note) in accordance with paragraph 11 reflecting the **Monthly Statement** issued pursuant to paragraph 1 (as may have been revised pursuant to the foregoing provisions), and no later than five (5) **Business Days** after such date of issue **NGESO** shall pay to the **Service Provider** (or the **Service Provider** shall pay to **NGESO**, as the case may be) the net amount shown as due from **NGESO** to the **Service Provider** (or from the **Service Provider** to **NGESO**, as the case may be) in that **Monthly Statement** (or revised **Monthly Statement**).
7. All payments shall be made in pounds sterling by direct bank transfer or equivalent transfer of immediately available funds to the other **Party's** bank account, details of which shall be as notified by each **Party** to the other from time to time in accordance with these **Response Service Terms**.
8. If by virtue of the foregoing provisions, it is determined or agreed that:
 - a. the **Service Provider** was entitled to a further payment from **NGESO**, then the **Service Provider** shall be entitled to interest at the **Base Rate** on the amount of such further payment from the due date until the date of actual payment; or
 - b. the **Service Provider** was not entitled to any payment it has received, then **NGESO** shall be entitled to interest at the **Base Rate** on such amount from the date of payment by **NGESO** until the date of repayment by the **Service Provider** (or, as the case may be, until the date when **NGESO** makes a payment to the **Service Provider** pursuant to paragraph 6 against which such amount is offset).
9. All amounts specified falling due and payable pursuant to these **Response Service Terms** shall be exclusive of any **Value Added Tax** or other similar tax and **NGESO** shall pay to the **Service Provider Value Added Tax** at the

rate for the time being and from time to time properly chargeable in respect of the making available and/or provision of the applicable **Auction Product** under these **Response Service Terms**.

10. Sums payable by one **Party** to the other pursuant this Schedule 3 whether by way of charges, interest or otherwise, shall (except to the extent permitted by these **Response Service Terms** or otherwise required by **Law**) be paid in full, free and clear of and without deduction, set-off or deferment in respect of any disputes or claims whatsoever provided that either **Party** shall be entitled to set off any payment due and payable by the other **Party** under this Schedule 3 against any payment it makes to that **Party** under this Schedule 3.
11. For so long as the **Service Provider** is a **Registered Response Participant**, the **Service Provider** agrees that **NGESO** shall maintain a self-billing system whereby each **Monthly Statement** shall constitute a self-billing invoice for **VAT** purposes. Accordingly, **NGESO** and the **Balancing Service Provider** shall enter into a self-billing agreement in accordance with **VAT** legislation and published guidance from HM Revenue and Customs from time to time, and agree to comply with all relevant requirements in relation to self-billing, and for such purpose the **Service Provider** hereby warrants and undertakes to **NGESO** that:-
 - a. it is registered for **VAT** and will inform **NGESO** forthwith if its ceases to be so registered or changes its **VAT** registration number;
 - b. it will account to HM Revenue and Customs for the **VAT** paid by **NGESO** pursuant to paragraph 9; and
 - c. it will not issue its own **VAT** invoices for provision of the applicable **Auction Product**.
12. The provisions of this Schedule 3 shall survive the termination of any **Response Contract**.