

## RESPONSE AUCTION TRIAL – SERVICE TERMS (PHASE 1)

### MODIFICATION HISTORY

Version	Publication Date	Effective from	Summary of Change(s)	Affected Provision(s)
1.0	11 <sup>th</sup> May 2019	13 <sup>th</sup> June 2019	First Version	N/A
1.1	4 <sup>th</sup> June 2019	13 <sup>th</sup> June 2019	Clarification that Demand reduction to zero equates to the Contracted Response Capacity	Paragraph 6.5i (page 4)
			Amendment of reference from “Auction Clearing Price” to “Market Clearing Price”	Schedule, Part 1 (page 8)
			Clarification that baseline power is as described in paragraph 6.5i	Schedule, Part 1 (page 9)
			Several amendments from “activation period” to “activation” and “activation period, a” to “activation, a”	Schedule
			Amendment to formula from: $k_{Sa} = \text{MAX}(0, \text{MIN}(1, e_{Sa} - A_s/Z_s - A_s))$ to: $k_{Sa} = \text{MAX}(0, \text{MIN}(1, 1 - e_{Sa} - A_s/Z_s - A_s))$	Schedule, Part 1 (page 13)
			<ul style="list-style-type: none"> <li>- Change of description from “Constant” to “Name”.</li> <li>- Change of value for <math>Z_s</math> from 1740 to <math>A_s - 60</math></li> </ul>	Schedule, Part 1 (Variable Data Table) Page 15

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## Contents

1.	Introduction	4
2.	Changes to these Response Auction Service Terms	4
3.	General Terms and Conditions and Glossary of Terms	4
4.	Response Auction Contracts	4
5.	Service Availability	4
6.	Service Delivery	5
7.	Availability Payments	5
8.	Payment Procedure	6
9.	Grid Code and Distribution Code	6
10.	Maintenance of Eligible Assets	6
11.	Third Party Claims	6
12.	Provision of Other Services	7
13.	Communications	7
14.	Termination of Response Auction Contracts	7
15.	Monitoring and Metering Data	8

SCHEDULE – AVAILABILITY PAYMENTS .....	9
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## 1. Introduction

- 1.1 These **Response Auction Service Terms** shall apply to each **Service Provider** and **Response Unit** the subject of a **Response Auction Contract** where, in accordance with the **Response Auction Rules**, and for any **Service Week** the **Service Provider's Sell Order(s)** for that **Response Unit** is/are accepted by **NGESO**.
- 1.2 Each **Response Auction Contract** shall be governed by these **Response Auction Service Terms**, and shall comprise a legally binding contract between **NGESO** and the **Service Provider**.

## 2. Changes to these Response Auction Service Terms

- 2.1 **NGESO** may update these **Response Auction Service Terms** from time to time by publication of the changes on its website, and unless required by **Law** to be effective earlier shall be effective from 00.00 hours on the next following **Auction Day** (or any later **Auction Day** as may be specified by **NGESO**) provided that **NGESO** has published the changes by no later than 12:00 hours on the **Day** falling seven (7) **Days** prior to that **Auction Day**.
- 2.2 When publishing changes to these **Response Auction Service Terms**, **NGESO** may also publish a consolidated version of changes made to the **Response Auction Service Terms**, but the consolidated version will not be a formal document and may not be relied upon in any way by **Service Providers**.

## 3. General Terms and Conditions and Glossary of Terms

- 3.1 These **Response Auction Service Terms** are subject to the prevailing **General Terms and Conditions** published by **NGESO** alongside these **Response Auction Service Terms**.
- 3.2 Unless the context otherwise requires, any capitalised term used in these **Response Auction Service Terms** shall have the meaning given to it (if any) in the prevailing **Glossary of Terms and Rules of Interpretation**, and the rules of interpretation set out in that document shall also apply.
- 3.3 For the purposes of paragraphs 3.1 and 3.2, with respect to any **Response Auction Contract**, "prevailing" shall mean the latest version of the applicable document which is in effect on the applicable **Auction Day** in accordance with its terms.

## 4. Response Auction Contracts

- 4.1 Each **Response Auction Contract** shall be automatically formed in accordance with the **Response Auction Rules**.
- 4.2 A **Response Auction Contract** shall relate to a single **Response Unit** and **Response Auction Product**, and shall apply only to the **Contracted EFA Block(s)** in a single **Service Week**.
- 4.3 Each **Response Auction 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 **Response Auction Product** to be delivered during the **Contracted EFA Block(s)** upon the terms of these **Response Auction 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 any **Response Auction Product** except pursuant to a **Response Auction Contract** formed in respect of that **Response Unit** for **Contracted EFA Block(s)** in that **Service Week**.
- 4.4 Neither **Party** may terminate a **Response Auction Contract** once formed except as provided or referred to in paragraph 14 or by agreement in writing between the **Parties**.

## 5. Service Availability

- 5.1 The **Service Provider** will procure that, with respect to each **Response Auction Contract**, **Response** is made available from the **Response Unit** for delivery throughout each **Contracted EFA Block** in the applicable **Service Week** in the manner provided in paragraph 6.
- 5.2 The **Service Provider** shall notify **NGESO** by facsimile forthwith upon becoming aware that any **Response Unit** (including any component **Eligible Asset**) has or will become technically unable to provide the **Contracted Response Capacity** in all or any part of any **Contracted EFA Block**, including where the level of **Contracted Response Capacity** has reduced.

- 5.3 All notifications by the **Service Provider** pursuant to paragraph 5.2 shall, upon request by **NGESO**, be followed promptly by an explanation in sufficient (but not excessive) detail to enable **NGESO** to understand and verify the cause of the lost or reduced **Contracted Response Capacity**.
- 5.4 For the avoidance of doubt, a **Service Provider** may not declare a **Response Unit** unable to provide the **Contracted Response Capacity** (to any extent) on commercial grounds or for reasons otherwise unrelated to the technical capability of the relevant **Eligible Asset(s)** or associated monitoring and despatch facilities.
- 5.5 With effect from the start of any period of lost or reduced **Contracted Response Capacity** (whether or not notified by the **Service Provider** pursuant to paragraph 5.2) and until the date when the **Service Provider** notifies **NGESO** of a restoration of full **Contracted Response Capacity** (or expiry of the **Response Auction Contract** if earlier), the **Response Unit** shall, for the purposes of paragraph 7, be deemed to be unavailable to deliver the **Response Auction Product**.
- 5.6 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 Auction Contract**.

## 6. Service Delivery

- 6.1 Throughout each **Contracted EFA Block**, and except to the extent **NGESO** is notified of any lost or reduced **Contracted Response Capacity** from the **Response Unit** pursuant to paragraph 5.2, the **Service Provider** shall procure the delivery of **Response** in accordance with this paragraph 6.
- 6.2 With respect to **LFS**, for the duration of each **Contracted EFA Block** and by operation of arming of a **Relay** or similar **Plant** and **Apparatus**, the **Service Provider** shall procure the activation of **LFS** from a **Response Unit** upon each transgression in **System Frequency** below the **LF Trigger Level** so as to deliver, in the manner provided in paragraph 6.5, **Response** of an amount equal to the **Contracted Response Capacity** within one (1) second of such transgression and sustained for at least the **Delivery Period** (or, where the **Delivery Period** is less than thirty (30) minutes, such longer period as **NGESO** may agree with the **Service Provider** pursuant to paragraph 6.4).
- 6.3 The **Service Provider** shall further procure that, following operation of the **Relay** or similar **Plant** and **Apparatus** as described in paragraph 6.2, **Response** delivered from the **Response Unit** both monotonically increases up to the start of the **Delivery Period** and monotonically decreases following expiry of the **Delivery Period**.
- 6.4 The **Parties** may from time to time agree in writing that, where the **Delivery Period** is less than thirty (30) minutes, the **Service Provider** shall sustain **Response** from the **Response Unit** for a period longer than the **Delivery Period** (provided that such extended period shall not exceed thirty (30) minutes).
- 6.5 For the purposes of paragraph 6.2:-
- LFS** shall be delivered either as an increase in **Generation** from zero (0) MW or as a reduction in **Demand** to zero (0) MW, and accordingly where delivered as a reduction in **Demand** the **Contracted Response Capacity** shall be the **Demand** of the **Response Unit** during the **Contracted EFA Block**;
  - the activation of **LFS** and delivery of **Response** in a **Contracted EFA Block** shall be sustained for the **Delivery Period** (or as otherwise provided in paragraph 6.2) notwithstanding expiry of that **Contracted EFA Block**; and
  - in the case of adjoining **Contracted EFA Blocks**, **Response** shall be delivered in accordance with the **Response Auction Contract** which relates to the **Contracted EFA Block** in which the **LFS** was activated.

## 7. Availability Payments

- 7.1 In respect of each **Response Auction Contract**, **NGESO** shall, in accordance with paragraph 8, pay to the **Service Provider** an **Availability Payment** calculated in accordance with the formulae in the Schedule to these **Response Auction Service Terms**.
- 7.2 No **Availability Payment** shall be made by **NGESO** to the **Service Provider** pursuant to this paragraph 7 in respect of any period or periods of deemed unavailability pursuant to paragraph 5.5.

## 8. Payment Procedure

8.1 In respect of each calendar month in the **Auction Trial Period** during which the **Service Provider** shall have been party to one or more **Response Auction Contracts**, and by no later than expiry of the second calendar month which follows, **NGESO** shall send to the **Service Provider** in accordance with paragraph 4 (*Payments*) of the **General Terms and Conditions** a **Monthly Statement** setting out, in respect of each such **Response Auction 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 paragraph 4 (*Payments*) of the **General Terms and Conditions** shall apply.

## 9. Grid Code and Distribution Code

The provision by the **Service Provider** of any of the **Response Auction Products** 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**.

## 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 **Response Auction Product(s)** in accordance with each **Response Auction Contract** and these **Response Auction Service Terms**.

## 11. Third Party Claims

11.1 The **Service Provider** undertakes to **NGESO** that the availability and delivery of a **Response Auction Product** from any **Response Unit** pursuant to and in accordance with each **Response Auction Contract** and these **Response Auction Service Terms** 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** delivers any **Response Auction Product** in accordance with these **Response Auction Service Terms** in consequence of which **NGESO** suffers or incurs any loss in respect of a claim brought by any third party related to any actual or alleged breach or non-compliance by the **Service Provider** as described in paragraph 11.1, then the **Service Provider** shall indemnify **NGESO** against all and any losses, liabilities, claims, expenses and demands suffered or incurred by **NGESO** in connection therewith. Such indemnity shall include any legal costs and expenses reasonably incurred in the contesting of such claims including the court costs and reasonable attorney's fees and other professional advisors' fees. The **Parties** agree and accept that, for the purposes of paragraph 5 (*Limitations on Liability*) of the **General Terms and Conditions**, all such legal costs and expenses expressed to be the subject of such indemnity shall be treated as direct losses.

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



expenses incurred in connection with the provision of any such information, assistance or particulars in the contesting of any such claim.

## 12. Provision of Other Services

- 12.1 The **Service Provider** undertakes to **NGESO** that the availability and delivery of **Response Auction Products** from any **Response Unit** pursuant to and in accordance with a **Response Auction Contract** and these **Response Auction Service Terms** will not at any time during any **Contracted EFA Block** be impaired or otherwise prejudiced by the **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** is unable to provide a **Response** service (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 give a full explanation to **NGESO** in its notification of lost or reduced **Contracted Response Capacity** pursuant to paragraph 5.2, and **NGESO** may in its absolute discretion (except where paragraph 12.5 applies) terminate the **Response Auction 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 Auction 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 Auction 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 Auction Contract** calculated by reference to all **Contracted EFA Blocks** in the relevant **Service Week** (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 **Response Auction Products** cannot be provided simultaneously with such other **Balancing Service** and to the extent that such service provision either overlaps to any extent with a **Contracted EFA Block** and/or is otherwise inconsistent or in conflict with the delivery of a **Response Auction Product**, then the relevant **Response Unit** shall be deemed unavailable for the purposes of paragraph 7.
- 12.6 Where, during any one or more **Settlement Periods** in a **Contracted EFA Block**, a **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.

## 13. Communications

- 13.1 Any communications required by these **Response Auction Service Terms** to be given in writing shall unless otherwise provided in this paragraph 13 be made and deemed to have been received in accordance with paragraph 10 (*Notices*) of the **General Terms and Conditions** save as may be otherwise agreed by the **Parties**.
- 13.2 The **Parties** consent to the recording of all telephone conversations between them relating in whole or in part to these **Response Auction Service Terms**, and each **Party** agrees to notify its employees of that consent and obtain their consent to that recording if required by **Law**.

## 14. Termination of Response Auction Contracts

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

- 14.2 where the **Service Provider** is in breach of a warranty or declaration given under any of the **Registration Documents**;
- 14.3 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 **Response Auction Product** in one or more **Contracted EFA Blocks**; or
- 14.4 where the **Service Provider** fails to comply in any material respect with its obligations under the **Testing Guidelines**, including where **NGESO** determines (acting reasonably) that the **Service Provider's Independent Technical Expert** is failing to meet the **Required Technical Standard** (as defined in the **Technical Guidance**) and/or is not sufficiently Independent (as defined in the **Technical Guidance**)

## 15. Monitoring and Metering Data

To enable **NGESO** to monitor the availability and delivery of **LFS** pursuant to a **Response Auction Contract**, the **Service Provider** shall procure and retain (for a period of twelve (12) months) second by second measurements of **Actual Response** from each **Eligible Asset** comprising a **Response Unit** throughout all **Contracted EFA Blocks** (in this paragraph 15, the "**Relevant Data**") and shall make the **Relevant Data** available to **NGESO** within seven (7) **Days** of **NGESO's** written (which shall include email) request and in such format as **NGESO** may reasonably require.



## SCHEDULE – AVAILABILITY PAYMENTS

### Part I – LFS

Upper case subscripts are used as part of the names of constants and variables, and lower case subscripts are reserved for indices:

- $a$  is the index of service activations within the **Service Week**
- $e$  is the index of **Contracted EFA Blocks** within the **Service Week**
- $i$  is the index of seconds within the relevant **Contracted EFA Block**
- $j$  is the index of seconds within the relevant service activation

The payment formula is:

$$S = \left( \sum_{e=1}^{n_e} (V_e P_e h_e F_e) \right) K$$

Where

- $S$  is the settlement value calculated for the relevant **Service Week**
- $P_e$  is the **Contracted Response Capacity** in megawatts, for the relevant **Contracted EFA Block**
- $V_e$  is the applicable **Market Clearing Price**, in GBP/MW/h, for the relevant **Contracted EFA block**
- $h_e$  is the length of the relevant **Contracted EFA Block**, in hours
- $F_e$  is 0 where there is any period or periods of unavailability of **LFS** during the relevant **Contracted EFA Block**, otherwise is 1
- $K$  is the product of  $K_B K_D K_P K_S K_Y$

And where

- $K_B$  is the **Response Baseline Performance Factor** for the relevant **Service Week**, defined below
- $K_D$  is the **Response Delay Time Performance Factor** for the relevant **Service Week**, defined below
- $K_P$  is the **Response Power Performance Factor** for the relevant **Service Week**, defined below
- $K_S$  is the **Response Sustain Time Performance Factor** for the relevant **Service Week**, defined below
- $K_Y$  is the **Response Recovery Performance Factor** for the relevant **Service Week**, defined below

For the purposes of this Part I:

$T$  = the time in Coordinated Universal Time (UTC) to the resolution of 1 second

For any activation,  $a$ :

$T_{0a}$  is the response activation time and is set equal to  $T$  at the first time when **System Frequency** is less than or equal to the **LF Trigger Level** during a **Contracted EFA Block** when **Response** is available from the relevant **Response Unit** (for the avoidance of doubt, when a **Response Unit** is not already providing **LFS** or in a recovery period following a prior activation)

$T_{1a}$  is the response delivery start time and is set equal to  $T$  when the response provided by a **Response Unit** first reaches an acceptable level following activation, i.e.

$$T_{1a} = T_{0a} + \text{MIN}\{j: M_j - B_j \geq z_P P_e\}$$

Where:

- $M_j$  is the metered active power of the **Response Unit**, per second
- $B_j$  is the baseline power of the **Response Unit**, per second, [as more particularly described in paragraph 6.5i](#)
- $z_P P_e$  (where  $z_P$  defined later) describes a threshold minimum response power level

$T_{2a}$  is the response delivery end time and is set equal to  $T$  when the response provided by a **Response Unit** first falls below an acceptable level following activation, i.e.

$$T_{2a} = T_{0a} + \{j: M_j - B_j \leq z_P P_e, T > T_{1a}\}$$

$T_{3a}$  is the response recovery end time and is set equal to  $T$  when  $t_Y$  seconds have elapsed since  $T_{0a}$ .

$$T_{3a} = T_{0a} + t_Y$$

Where  $t_Y$  is the recovery time period, the value of which is given in the Variable Data Table at the end of this Schedule

### Response Baseline Performance Factor

For each second,  $i$ , in  $\{1, 2, \dots, n_i\}$ , where  $n_i$  is the number of seconds within each **Contracted EFA Block**,  $e$ , within each **Service Week**, calculate

$$e_{Bei} = \frac{\text{ABS}(B_e - M_i)}{P_e}$$

$$k_{Bei} = \text{MAX}\left(0, \text{MIN}\left(1, \frac{e_{Bei} - A_B}{Z_B - A_B}\right)\right)$$

For each **Contracted EFA Block**,  $e$ , in  $\{1, 2, \dots, n_e\}$ , where  $n_e$  is the number of **Contracted EFA Blocks** within a **Service Week**, calculate

$$k_{Be} = \text{MIN}_{i \in \{1, 2, \dots, n_i\}} (k_{Bei})$$

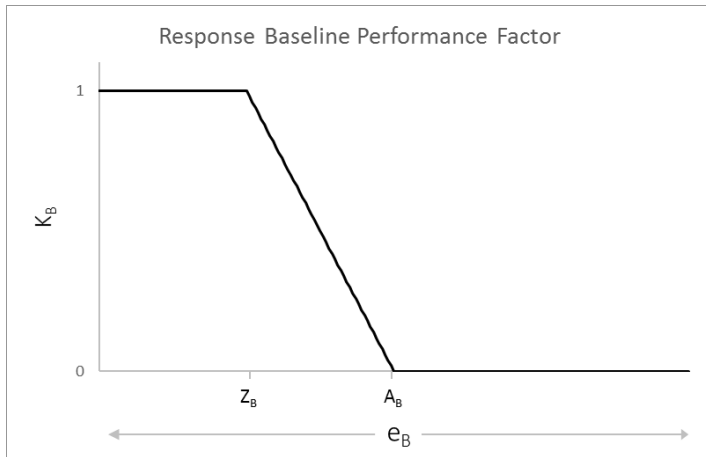
Finally calculate the **Response Baseline Performance Factor**,  $K_B$ , as:

$$K_B = \text{MIN}_{e \in \{1, 2, \dots, n_e\}} (k_{Be})$$

Where

- $e_{Bei}$  is the absolute relative error in baseline power, evaluated per second
- $k_{Bei}$  is the response baseline performance score, evaluated per second
- $k_{Be}$  is the response baseline performance score, evaluated per **Contracted EFA Block**
- $A_B$  and  $Z_B$ , the values of which are given in the Variable Data Table at the end of this Schedule, define the vertices of the performance curve with respect to  $e_{Bei}$

In the case of no data being provided on request,  $K_B$  shall take the default value of 0.0.



### Response Delay Performance Factor

For each activation,  $a$  in  $\{1, 2, \dots, n_a\}$ , where  $n_a$  is the number service activations within a **Service Week**, calculate:

$$e_{Da} = T_{1a} - T_{0a}$$

$$k_{Da} = \text{MAX}\left(0, \text{MIN}\left(1, 1 - \frac{e_{Da} - A_D}{Z_D - A_D}\right)\right)$$

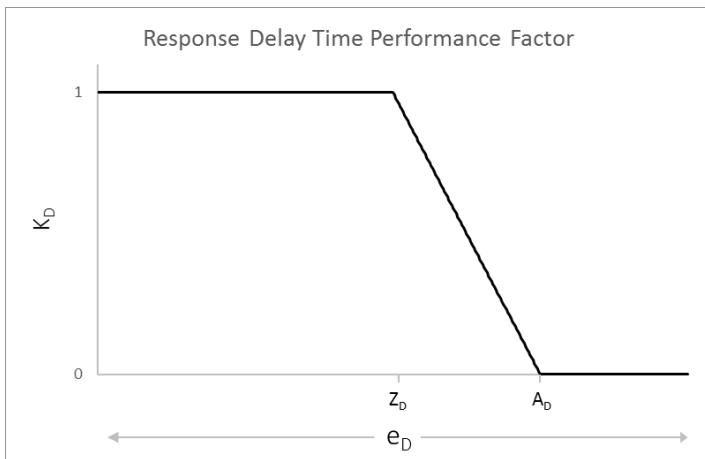
Finally calculate the **Response Delay Performance Factor**,  $K_d$ , as:

$$K_d = \text{MIN}_{a \in \{1, 2, \dots, n_a\}}(k_{Da})$$

Where

- $e_{Da}$  is the response delivery delay time in seconds, evaluated per activation
- $A_D$  and  $Z_D$ , the values of which are given in the Variable Data Table at the end of this Schedule, define the vertices of the performance curve with respect to  $e_{Da}$

In the case of no activations being required during a service week (i.e. if  $n_a = 0$ ),  $K_D$  shall take the default value of 1.0.



### Response Power Performance Factor

For each second,  $j$ , in  $\{1, 2, \dots, n_j\}$ , where  $n_j$  is the number of seconds within each activation,  $a$ , in  $\{1, 2, \dots, n_a\}$ , calculate:

$$e_{Paj} = \frac{\text{ABS}(B_e + P_e - M_{aj})}{P_e}$$

$$k_{pji} = \text{MAX}\left(0, \text{MIN}\left(1, \frac{e_{Paj} - A_p}{Z_p - A_p}\right)\right)$$

For each activation,  $a$ , in  $\{1, 2, \dots, n_a\}$ , calculate:

$$k_{pj} = \text{MIN}_{j \in \{1, 2, \dots, n_j\}}(k_{paj})$$

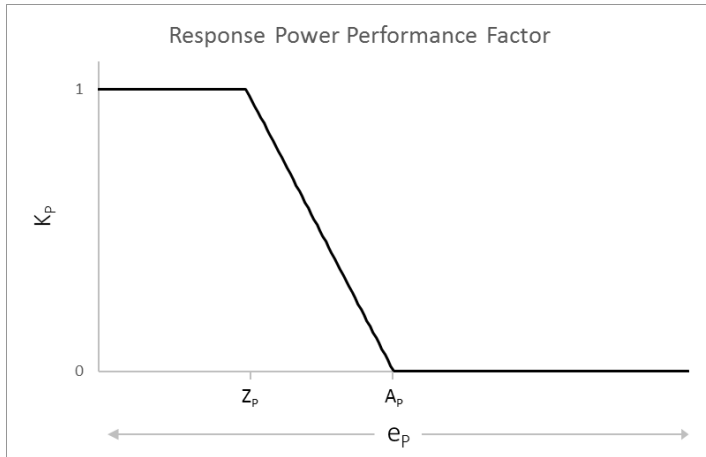
Finally, calculate the **Response Power Performance Factor**,  $K_p$ , as:

$$K_p = \text{MIN}_{a \in \{1, 2, \dots, n_a\}}(k_{pa})$$

Where

- $B_e$  is the baseline power for the **Contracted EFA Block** at the time of activation
- $e_{Paj}$  is the absolute relative error in response power, evaluated per second
- $k_{Paj}$  is the response power performance score, evaluated per second
- $A_p$  and  $Z_p$ , the values of which are given in the Variable Data Table at the end of this Schedule, define the vertices of the performance curve with respect to  $e_{Paj}$

In the case of no activation being required during a contract period,  $K_p$  shall take the default value of 1.0.



### Response Sustain Performance Factor

For each activation,  $a$  in  $\{1, 2, \dots, n_a\}$ , where  $n_a$  is the number service activations within a **Service Week**, calculate:

$$e_{sa} = T_{2a} - T_{0a}$$

$$k_{sa} = \text{MAX}\left(0, \text{MIN}\left(1, 1 - \frac{e_{sa} - A_s}{Z_s - A_s}\right)\right)$$

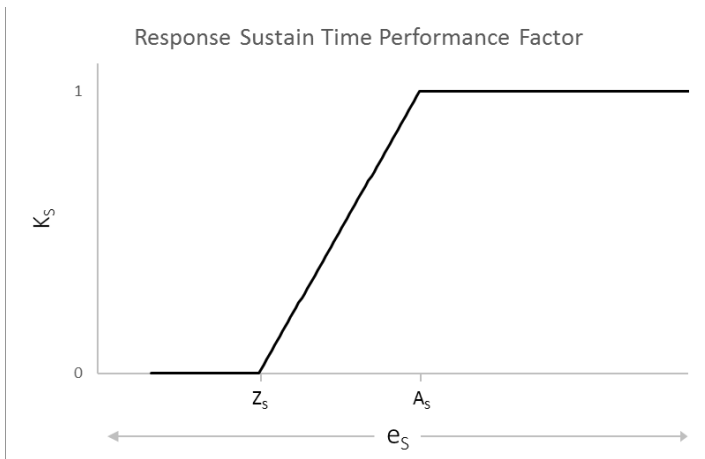
Finally calculate the **Response Sustain Time Performance Factor**,  $K_s$ , as:

$$K_s = \text{MIN}(k_{sa})$$

Where:

- $e_{sa}$  is the response sustain time, in seconds, evaluated per activation
- $A_s$  and  $Z_s$ , the values of which are given in the Variable Data Table at the end of this Schedule, define the vertices of the performance curve with respect to  $e_{sa}$

In the case of no activation being required during a contract period,  $K_s$  shall take the default value of 1.0.



### Response Recovery Performance Factor

For each second,  $j$ , in  $\{1, 2, \dots, n_j\}$ , where  $n_j$  is the number of seconds within each activation,  $a$ , in  $\{1, 2, \dots, n_a\}$ , calculate:

$$Y_{aj} = \min \left( 0, \max \left( \begin{array}{l} B_e - P_e \left( g_Y \frac{j-t_S}{60} - a_Y \right), \\ -P_e g_P, \\ B_e + P_e \left( g_Y \frac{j-t_Y}{60} - a_Y \right) \end{array} \right) \right)$$

$$e_{Yaj} = \frac{M_{aj} - Y_{aj}}{P_P}$$

$$k_{Yji} = \max \left( 0, \min \left( 1, 1 + \frac{e_{Yaj} - A_Y}{Z_Y - A_Y} \right) \right)$$

For each activation,  $a$ , in  $\{1, 2, \dots, n_a\}$ , calculate:

$$k_{Ya} = \min_{j \in \{1, 2, \dots, n_j\}} (k_{Yaj})$$

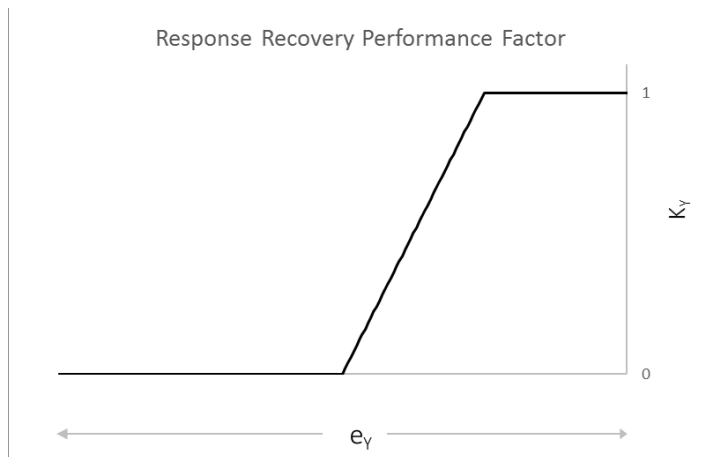
Finally, calculate the **Response Recovery Performance Factor**,  $K_Y$ , as:

$$K_Y = \min(k_{Ya})$$

Where:

- $e_{Yaj}$  is the relative error in recovery power, evaluated per second
- $g_P$  is the relative maximum recovery power limit, the value of which is given in the Variable Data Table at the end of this Schedule
- $g_Y$  is the relative recovery power rate, the value of which is given in the Variable Data Table at the end of this Schedule
- $Y_{aj}$  is the recovery power limit, evaluated per second
- $A_Y$  and  $Z_Y$ , the values of which are given in the Variable Data Table at the end of this Schedule, define the vertices of the performance curve with respect to  $e_{Yaj}$

In the case of no activation being required during a contract period,  $K_Y$  shall take the default value of 1.0.





## Variable Data Table

Name	Value
$A_B$	0.10
$Z_B$	0.05
$A_D$	2.00
$Z_D$	3.00
$A_P$	0.10
$Z_P$	0.05
$t_s$	1800
$t_Y$	5400
$A_s$	$t_s$
$Z_s$	$A_s-60$
$A_Y$	-0.10
$Z_Y$	-0.05
$g^P$	1.00
$g^Y$	0.05

## Part II – Not Used