

Applicable Balancing Services Volume Data Methodology Statement

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National Grid Electricity Transmission Licence

Version Control

Date	Version No.	Notes
07.02.03	1.0	Initial version
28.11.03	1.1	Revision to incorporate Maximum Generation Service and Commercial Intertrips as an Applicable Balancing Services
04.10.04	2.0	Revisions to incorporate changes as a result of CAP071: the development of Maximum Generation Service
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15.7.05	2.2	Revisions to incorporate changes as a result of CAP076: Treatment of System to Generating Intertripping Schemes
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This Statement has been developed in consultation with the industry and the Authority. The Statement may only be modified in accordance with the processes set out in Standard Condition C16 of the Transmission Licence.

The latest version of this document is available, together with the relevant change marked version (if any), electronically from the National Grid Website:

<http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/Balancing-framework/Transmission-license-C16-statements/>

Alternatively a copy may be requested from the following address:

Head of Market Change - Electricity

National Grid

National Grid House

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PART A: INTRODUCTION

1. Purpose of Document

This document sets out the Applicable Balancing Services Volume Data Methodology that National Grid Electricity Transmission plc (NGET) is required to establish in accordance with Standard Condition C16 of the Transmission Licence. The purpose of this Statement is to set out the information on Applicable Balancing Services that will be taken into account under the Balancing and Settlement Code for the purposes of determining Imbalance Volumes.

This Statement has been developed in consultation with the industry and the Authority. The Statement may only be modified in accordance with the processes set out in Standard Condition C16 of the Transmission Licence. Where we buy, sell or acquire a Balancing Service of a kind or under a mechanism which potentially affects a Party's imbalance position, and it is not covered by this Statement then we shall promptly seek to establish a revised Statement covering such Balancing Services and/or mechanisms in accordance with the relevant provisions of Standard Condition C16 of the Transmission Licence.

The Statement makes reference to a number of definitions contained in the Grid Code, the Connection and Use of System Code and the Balancing and Settlement Code. In the event that any of the relevant provisions in the Grid Code, the Connection and Use of System Code or the Balancing and Settlement Code are amended it may become necessary for us to modify the Statement in order that it remains consistent with the Grid Code, the Connection and Use of System Code and the Balancing and Settlement Code.

In any event, where our statutory obligations or the provisions of the Grid Code are considered inconsistent with any part of this Statement,

then the relevant statutory obligation and/or Grid Code provision will take precedence.

Unless defined in this Statement, terms used herein shall have the same meanings given to them in the Transmission Licence, the Grid Code, the Connection and Use of System Code and/or the Balancing and Settlement Code as the case may be. In this Statement, all references to 'National Grid' shall mean NGET, being the Transmission Company for the purposes of the Balancing and Settlement Code.

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PART B: APPLICABLE BALANCING SERVICES VOLUME DATA ‘ABSVD’

1. Basis of Calculation

1.1 Variables included in the ABSVD

The ABSVD is specified in Section Q, Paragraph 6.4 of the Balancing and Settlement Code and consists of QAS_{ij} , being the *Applicable Balancing Services Volume Data* in respect of BM Unit i , in Settlement Period j , determined in accordance with this Statement.

The inclusion of any individual Applicable Balancing Service within the Applicable Balancing Services Volume Data is at the discretion of the Lead Party of the relevant BM Unit (see part C, section 2) unless otherwise directed in the CUSC. Where an Applicable Balancing Service provider is not the Lead Party of the BM Unit to which the energy is attributed, the inclusion or exclusion of the energy is a matter of negotiation between the service provider and the Lead Party of the BM Unit.

The Applicable Balancing Services Volume Data is used in the calculation of Period BM Unit Balancing Services Volume, QBS_{ij} . QBS_{ij} is the volume of all energy associated with balancing services used in the determination of imbalance. It consists of the volume of Bid Offer Acceptances plus the Applicable Balancing Services Volume Data. The determination of QBS_{ij} is specified in Section T, Paragraph 4.3.2 of the Balancing and Settlement Code:

$$QBS_{ij} = \sum^n (QAO^n_{ij} + QAB^n_{ij}) + QAS_{ij}$$

where \sum^n represents the sum over all Bid-Offer Pair numbers for the BM Unit.

QBS_{ij} is the volume of Balancing Services per BM Unit. For determination of the account's imbalance volume, it is necessary to determine the Balancing Services volume delivered across the account, QABS_{aj} (the Account Period Balancing Services Volume). This is determined as the sum across the energy account of the Balancing Services volume for each BM unit, multiplied by the applicable loss factor, as specified in Section T, paragraph 4.6.2 of the Balancing and Settlement Code.

$$QABS_{aj} = \sum_i QBS_{ij} \times TLM_{ij}$$

Where \sum_i represents the sum over all BM Units for which such Energy Account is the corresponding Energy Account of the Lead Party.

The Account Energy Imbalance Volume, QAEI_{aj}, is the difference between the energy credited to the account, less the contract position and the Account Period Balancing Services Volume, as specified in accordance with section T, paragraph 4.6.3 of the Balancing and Settlement Code.

$$QAEI_{aj} = QACE_{aj} - QABS_{aj} - QABC_{aj}$$

The Account Energy Imbalance Volume is then multiplied by System Sell Price for positive imbalance volume and System Buy Price for negative imbalance volume to give the Energy Imbalance Cashflows as specified in Section T, Paragraph 4.7 of the Balancing and Settlement Code.

1.2 Balancing Services for inclusion in the ABSVD

Balancing Services are defined in the Transmission Licence and described in more detail in the Procurement Guidelines, which National Grid is required to establish in accordance with Standard Condition

C16 of the Transmission Licence. The purpose of the Procurement Guidelines is to set out the kinds of Balancing Services which we may be interested in purchasing, together with the mechanisms by which we envisage purchasing such Balancing Services. ABSVD covers a subset of the Balancing Services that we intend to procure.

In general, Balancing Services, deemed to be Applicable will be those services required by the System Operator for economic operation of the transmission system, that result in the service provider being exposed to imbalance charges whilst assisting in system balancing. For the avoidance of doubt a consultation will be carried out prior to any further Balancing Services being included in the calculation of ABSVD.

The following Applicable Balancing Services contracts will be included in the calculation of the ABSVD:

- **Short Term Operating Reserve (STOR)** – Utilisation volumes for participants within the Balancing Mechanism will be dealt with automatically via the BM and will feed into the energy imbalance position via the acceptance of an Offer. Utilisation volumes for non-BM participants will not be subject to the acceptance of an Offer.

The calculation of ABSVD will not include the instructed volume from non-BM providers in relation to the utilisation of STOR.

- **Mode A Frequency Response** – Energy volumes will be determined in accordance with paragraph 4.1.3.9A of the Connection and Use of System Code.
- **Frequency Response other than Mode A Frequency Response** – Utilisation volumes will be determined in accordance with system frequency and the characteristic of the response service.

- **Fast Reserve** – Utilisation volumes for participants within the Balancing Mechanism will be dealt with automatically via the BM and will feed into the energy imbalance position via the acceptance of an Offer. Utilisation volumes for non-BM participants will not be subject to the acceptance of an Offer.

The calculation of ABSVD will include the instructed volume from non-BM providers in relation to the utilisation of Fast Reserve.

- **Commercial Intertrips** – Energy volumes as a result of the operation of the commercial intertrip will be calculated in accordance with the relevant Commercial Services Agreement.
- **Fast De-Load Service (a type of constraint management service)** – Energy volumes as a result of an instruction to fast de-load will be calculated in accordance with the relevant Commercial Services Agreement.
- **Maximum Generation Service** – Utilisation volumes will be calculated in accordance with the CUSC, the relevant Commercial Services Agreement and the methodology contained in Part C of this Statement.
- **System to Generator Operational Intertripping** - Utilisation volumes will be calculated in accordance with Part C of this Statement. For the avoidance of doubt, where an intertripping scheme is a Category 1 Intertripping Scheme as defined in the CUSC and determined within a generator's Bilateral Connection Agreement, SF_{sm} , will always be 0.

1.3 ABSVD Provision

ABSVD will be submitted in accordance with section Q, Paragraph 6.4 of the Balancing and Settlement Code. In outline this entails the submission of ABSVD within two Business Days following the relevant Settlement Day.

1.4 Re-submission of ABSVD

In the event that an error is identified in the ABSVD, the data will be re-submitted, as soon as reasonably practicable, once the corrected data is available.

PART C: ABSVD METHODOLOGY

1. Principles

QAS_{ij} will be determined in accordance with the following formula:

$$QAS_{ij} = \sum_{s \in i} (SE_{sj} \times SF_{sm})$$

where:

$\sum_{s \in i}$ is the summation across all Ancillary Service and Other Service provision (as referred to in the definition of Balancing Services within the Transmission Licence and described more fully in Parts B and C of the Procurement Guidelines), s , that contribute to the production or consumption of BM Unit i .

m is the relevant calendar month

s is the number of a discrete Ancillary Service or Other Service provision.

SE_{sj} Is the expected energy delivered by Ancillary Service or Other Service, s , in Settlement Period j as indicated below.

SF_{sm} is the Service Flag for Service s in calendar month m . It takes a value of 0 or 1 as notified by the lead party of the BM Unit which incorporates service s , in accordance with the Notification Procedure.

Determination of SE_{sj}

~~Where service s is a Mode A Frequency Response service or service s is a response service delivered by free governor action, other than a Mode A Frequency Response service:~~

Where service s is a Frequency Response service:

$$SE_{sj} = \int_0^{SPD} FR_{ij}(t) dt$$

where

$FR_{ij}(t)$ is defined in accordance with section 4, sub section 1, paragraph 4.1.3.9A of CUSC, except that:

- i. Reference to i should be construed as referring to the relevant service, s ;
- ii. Reference to the Mandatory Service Agreement should be construed as the relevant service agreement; and
- iii. Reference to Mode A Frequency Response should be construed as the relevant frequency response.

Where service s is fast reserve, STOR, or occasional (non-dynamic) response (and a bid offer acceptance is not issued in respect of the service call off):

$$SE_{sj} = \int_0^{SPD} E_{sj}(t) dt$$

Where

$E_{sj}(t)$ is the required energy from service s , time t from the start of settlement period j . The required energy is determined with reference to Figure 1 below.

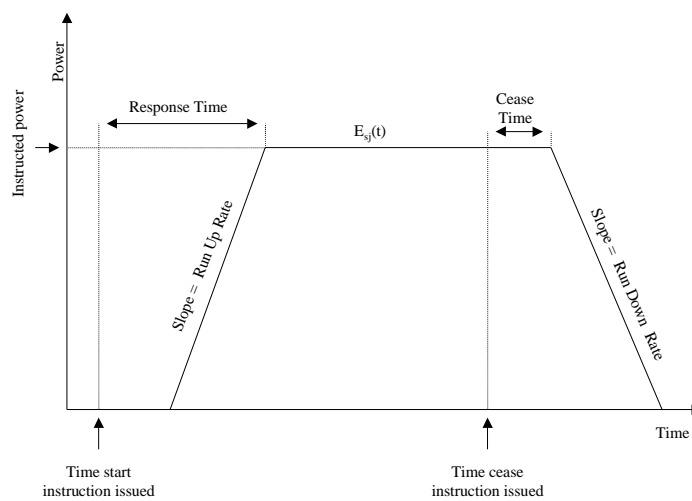


Figure 1 Graph showing determination of $E_{sj}(t)$

where

Time start instruction issued Is the time that National Grid issues an instruction to the service provider to start delivering the service, and the instruction is not subsequently rejected as being incorrectly issued. For the avoidance of doubt, instruction includes a signal from a relay (or other equipment) owned by National Grid to initiate the delivery of an occasional (non-dynamic) response service.

Time cease instruction issued	Is the time that National Grid issues an instruction to the service provider to cease delivering the service.
Response time	Is the time agreed between the provider and National Grid that it will take for the service to be fully delivered from the time the start instruction is issued. In the event that no time has been agreed, it will take the value 0 seconds.
Cease time	Is the time agreed between the provider and National Grid that it will take between a cease instruction been issued and the provider starting to cease delivery. In the event that no time has been agreed, it will take the value 0 seconds.
Run Up Rate	Is the rate agreed between the provider and National Grid that the provider will change load at, in response to a start instruction. In the event that no value has been agreed, it will be deemed to be infinite.
Run Down Rate	Is the rate agreed between the provider and National Grid that the provider will change load at, in response to a cease instruction. In the event that no value has been agreed it will be deemed to be infinite.
Instructed Power	Is the change in power production or consumption instructed by National Grid in accordance with the agreement between the provider and National Grid.

Where service s is the Maximum Generation Service,

$$SE_{sj} = \text{Min} (Q_{\text{max}ij}, X * \text{CEC}/2)$$

$Q_{max_{ij}}$	Is the calculated Maximum Generation Service volume as defined by $Max (QM_{ij} - (FPN_{ij} + \Sigma(QAB^n_{ij} + QAO^n_{ij})), 0)$
X	is 0.03 or such figure as may be either: (i) set out in the Maximum Generation Service Agreement for the available BM Unit or (ii) agreed or determined in accordance with Paragraphs 4.2.5.3 to 4.2.5.5 (inclusive) of the CUSC.
CEC	Connection Entry Capacity for the Available BM Unit as defined in the CUSC
QM_{ij} , QAB^n_{ij} , QAO^n_{ij} , $FPN_{ij}(t)$	Have the meanings ascribed to them in the Balancing and Settlement Code
MEL	Maximum Export Limit as defined in the Grid Code

For the avoidance of doubt, any Maximum Generation Service volume delivered in excess of X multiplied by CEC will be subject to the dispute provision set out in Paragraph 4.2.5 of CUSC. Any volume in excess of X multiplied by CEC will not be classed as an Applicable Balancing Services volume unless otherwise agreed or directed in accordance with the dispute provision set out in Paragraph 4.2.5 of CUSC.

The above calculation will be applied from the start of the settlement period during which the Maximum Generation Service Emergency Instruction has been issued until the end of the settlement period for

which the Maximum Generation Service Emergency Instruction is ceased.

The volume identified as Maximum Generation Service (assuming that a settlement period does not end following the issue of a ‘cease’ instruction, but prior to the return of output to MEL) using the above calculation is demonstrated in Fig 2 below.

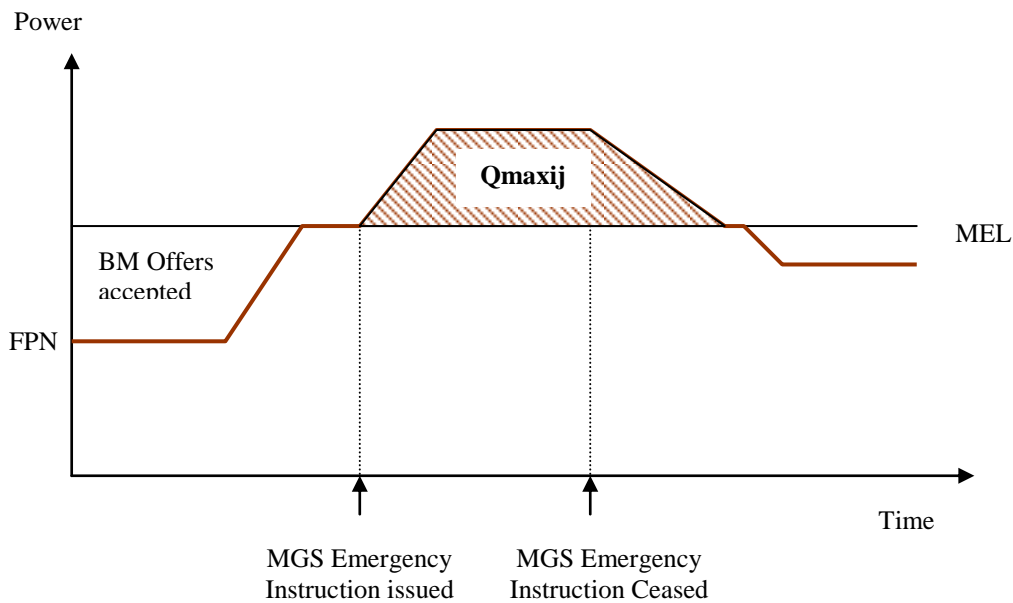


Figure 2 – Graph showing calculation of $Q_{max_{ij}}$

Where Service s is System to Generator Operational Intertripping Scheme, Commercial Intertripping Scheme or Fast De-Load Service, SE_{s_j} will be equal to the reduction in output calculated from the time of the intertrip firing or the fast de-load instruction until the end of the Balancing Mechanism Window Period. The volume output reduction (in MWh) over this period is equal to the integral of spot (MW) Final Physical Notification (FPN), plus the sum of all accepted Bid and Offer spot (MW) values covered by the period. Where an intertrip or fast de-load occurs on a modular BMU and does not affect all generating units that make up that BMU, the output of the remaining generating units will be taken off the total volume such that SE_{s_j} reflects the volume (MWh) associated with the intertrip or fast de-load. This is shown algebraically below:

$$\int_{t_0}^{t_1} \left(FPN_{ij}(t) + \sum^k (qABO^{kn}_{ij}(t)) - QM_{ij}(t) \right) dt$$

Where

- t_0 = time of intertrip firing or fast de-load instruction
- t_1 = time at end of Balancing Mechanism Window Period
- $FPN_{ij}(t)$ = Final Physical Notification as defined within the BSC
- $qABO^{kn}_{ij}(t)$ = Accepted Bid-Offer Volume as defined within the BSC
- \sum^k = Sum over each separate Bid Offer Acceptance
- $QM_{ij}(t)$ = Metered output of BM Unit i in settlement period j for spot time t, where Active Energy volumes are estimated from operational metering data held by the Transmission Company

An example of the volume calculated for a given set of circumstances, using the above calculation is demonstrated in Fig 3 below. For the avoidance of doubt, the 'wall' is the end of the Balancing Mechanism Window.

Fig 3 - Graph showing example of SE_{sj} for System to Generator Operational intertripping Scheme or a Commercial Intertripping Scheme (instantaneous trip)

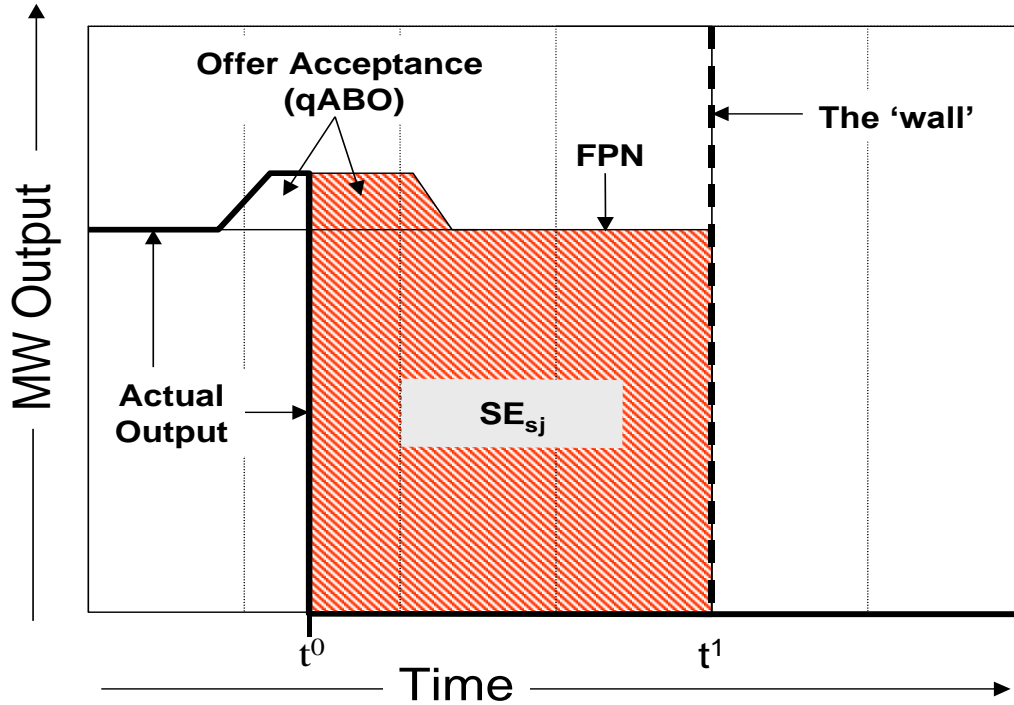
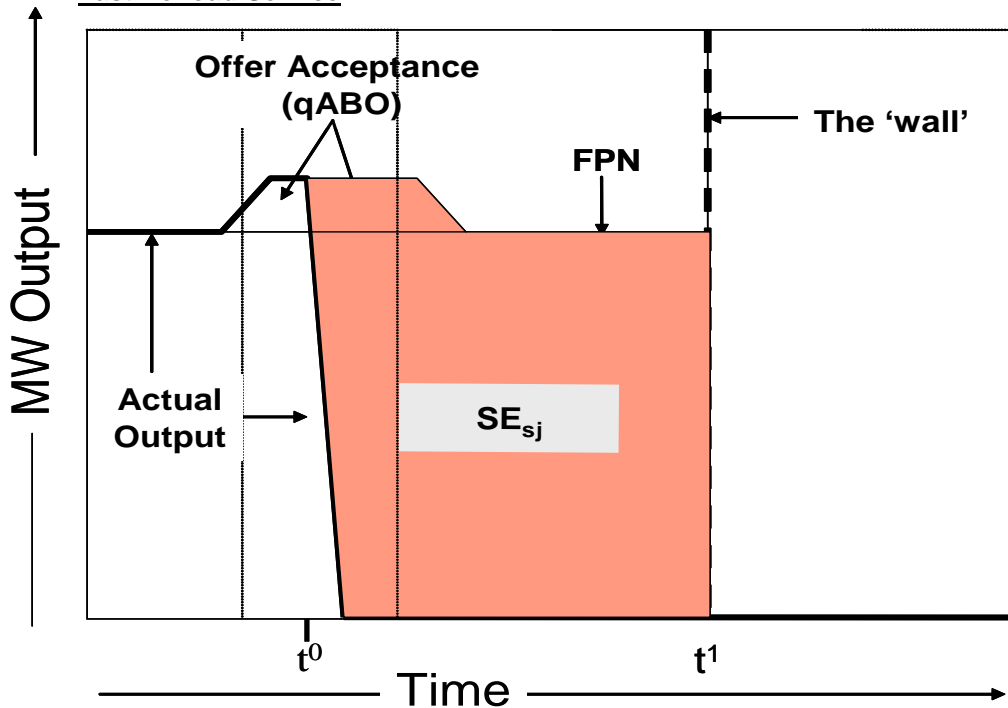


Fig 3a - Graph showing example of SE_{sj} for System to Generator Operational Intertripping Scheme or a Commercial Intertripping Scheme (time delayed) or a Fast De-load Service



For all other services:

$$SE_{sj} = 0$$

2. Notification Procedure

This procedure allows the Lead Party of a BM unit to notify National Grid, monthly in advance, which (if any) services should be included in the determination of QAS_{ij} unless otherwise directed within the CUSC for the BM unit(s) in respect of which they are the Lead Party.

The Lead Party of the BM Unit that incorporates service s may notify National Grid that the value of SF_{sm} to be 1 or 0.

The notification must be made in writing to:

The Settlement Manager
National Grid
National Grid House
Warwick Technology Park
Gallows Hill
Warwick CV34 6DA

For the notification to be valid, it must either:

- i. be received by National Grid more than 10 business days before the start of calendar month m ; or
- ii. be received by National Grid prior to the commencement of the contract for service s .

In the case of Category 1 System to Generator Operational Intertripping, SF_{sm} will always = 0. This is in line with the requirements set out under the CUSC.

In the event that no notification is received for the initial value of SF_{sm} , National Grid will allocate values as follows:

- i. In the event that service 's' is Mode A Frequency Response, or Category 2, 3 or 4 System to Generator Operational Intertripping Scheme
 $SF_{sm}=1$; otherwise
- ii. $SF_{sm}=0$.

For subsequent months where a notification is not received, National Grid will allocate a value to SF_{sm} , such that $SF_{sm}=SF_{s(m-1)}$.

These rules imply default initial notification of 'opt-in' for Mode A Frequency Response, and 'opt-out' for all other types of Balancing Services.

3. Disputes

A dispute arises where the Lead Party of the relevant BM Unit disagrees with the value of QAS_{ij} notified by National Grid. Where such a dispute arises, a representative of National Grid and each BSC Party concerned who has authority to resolve the dispute shall meet (including by agreement by telephone) within 10 Business Days of a request by either party (or within such longer period as may be agreed, acting reasonably) and seek to resolve it. If the parties to the dispute are unable to resolve it within 10 Business Days of the meeting (or within such longer period as they may agree within that initial 10 Business Day period, both parties acting reasonably as to the length of the period), then the parties' obligations under this paragraph to undertake such discussions shall no longer apply in relation to that dispute. Either party may then refer the dispute to arbitration pursuant to the rules of the Electricity Arbitration Association in force from time to time.

The laws of England shall be the proper law of reference to arbitration under this paragraph and in particular (but not so as to derogate from the generality of the foregoing) the provisions of the Arbitration Act

1996 shall apply to any such arbitration wherever it or any part of it shall be conducted.

Any arbitrator or panel of arbitrators appointed under this Paragraph 3 shall determine such issues as are referred to him or them consistently with any determination by the Authority, whether or not relating to the same or different facts.

For the avoidance of doubt, a party may only raise a dispute in respect of QAS_{ij} where they are Lead Party of the relevant BM Unit.

4. Worked Examples

4.1 Provision of Mode A Frequency Response

Note that this example would apply equally to other a-commercial frequency response services delivered by free governor action.

A generator delivers response as illustrated in Figure 2.

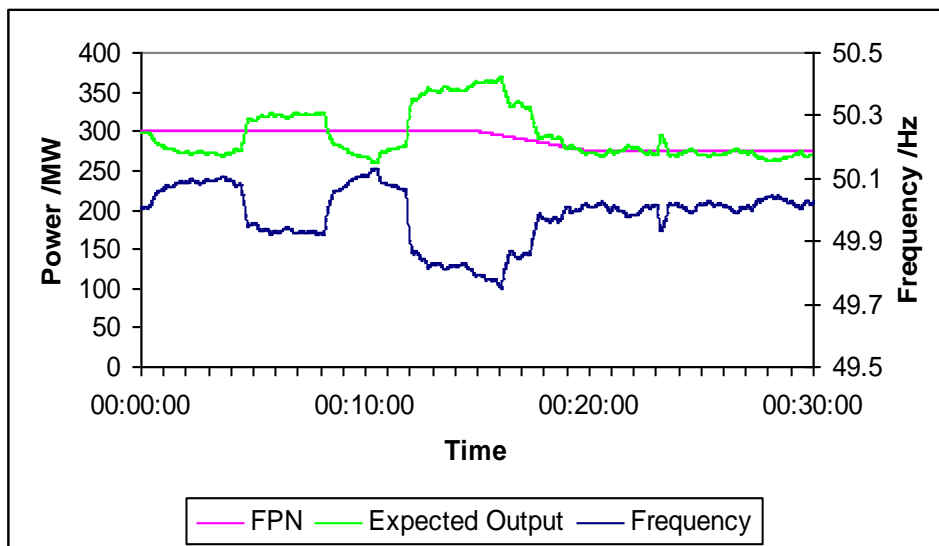


Figure 2 Example of Response Delivery

In accordance with this methodology and the provisions in section 4, sub section 1, paragraph 4.1.3.9A described in CUSC, QAS_{ij} is

determined to be 2.5 MWh (meaning that in the relevant half hour, as a result of providing response, an additional 2.5 MWh of energy was required to be produced).

If this party operated a single BM Unit with the following parameters for this settlement period, the impact on central settlement would be as follows:

Contracted Position (QABC _{aj})	137 MWh
Final Physical Notification (FPN _{ij})	145 MWh
Metered Production (QM _{ij})	147.5 MWh
Applicable Balancing Services Volume (QAS _{ij})	2.5 MWh
Transmission Loss Multiplier (TLM _{ij})	0.95
Bid Offer Acceptances	0 MWh

The credited energy volume QCE_{aj} is determined in accordance with the Balancing and Settlement Code, section T, paragraph 4.5.1(b):

$$\begin{aligned}
 QCE_{iajj} &= QM_{ij} \times TLM_{ij} - \sum_a QCE_{iajj} \\
 &= 147.5 \text{ MWh} \times 0.95 - 0 \text{ MWh} \\
 &= 140.13 \text{ MWh}
 \end{aligned}$$

(where \sum_a is the sum over Energy Accounts of Subsidiary Parties – in this example it is assumed that all energy is credited to the lead party.)

The account credited energy volume QACE_{aj}, would be calculated in accordance with the Balancing and Settlement Code, section T, paragraph 4.6.1:

$$\begin{aligned}
 QACE_{aj} &= \sum_i QCE_{iaj} \\
 &= 140.13 \text{ MWh}
 \end{aligned}$$

The Balancing Services Volume is determined in accordance with the Balancing and Settlement Code, section T, paragraph 4.3.2:

$$\begin{aligned} QBS_{ij} &= \sum^n (QAO_{ij}^n + QAB_{ij}^n) + QAS_{ij} \\ &= 0 + 2.5 \text{ MWh} \end{aligned}$$

The Account Period Balancing Services volume is determined in accordance with the Balancing and Settlement Code, section T, paragraph 4.6.2:

$$\begin{aligned} QABS_{aj} &= \sum_i QBS_{ij} \times TLM_{ij} \\ &= 2.5 \text{ MWh} \times 0.95 \\ &= 2.38 \text{ MWh} \end{aligned}$$

The Account Energy Imbalance Volume ($QAEI_{aj}$) is determined in accordance with the Balancing and Settlement Code, section T, paragraph 4.6.3:

$$\begin{aligned} QAEI_{aj} &= QACE_{aj} - QABS_{aj} - QABC_{aj} \\ QAEI_{aj} &= 140.13 \text{ MWh} - 2.38 \text{ MWh} - 137 \text{ MWh} \\ &= 0.75 \text{ MWh} \end{aligned}$$

In this example, the account would receive a payment for 0.75 MWh at System Sell Price, in accordance with the Balancing and Settlement code, section T, paragraph 4.7.1.

4.2 Provision of Short Term Operating Reserve (STOR)

Note that this example would apply equally to Fast Reserve or Occasional (non-dynamic) Response.

Consider a STOR provider with the following parameters:

Response Time 15 minutes
 Run Up Rate 10 MW/minute
 Run Down Rate – 5 MW/minute
 Cease Time 5 minutes

At 00:00 National Grid instructs 50 MW of STOR from the provider.

At 01:00 National Grid instructs the provider to cease delivery.

This leads to the delivery profile shown in figure 3:

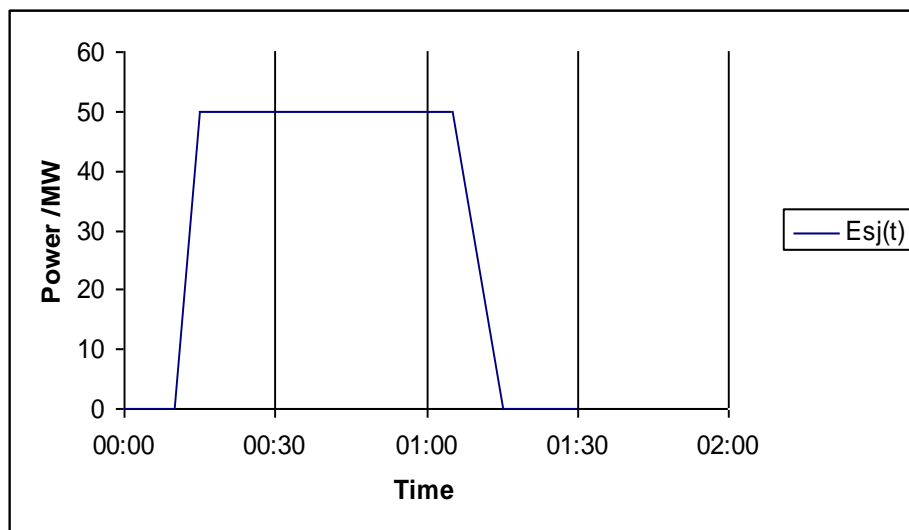


Figure 2 Example STOR Delivery

Settlement Period (Start time)	00:00	00:30	01:00	01:30
SE_{sj}/MWh	14.58	25	8.33	0

If this were the only Applicable Balancing Service provision within the BM unit with the service flag set to 1, then QAS_{ij} would take the same values.

If this party operated a single BM Unit with the following parameters for the settlement period starting 00:30, then the impact on central settlement would be as follows:

Contracted Position (QABC _{aj})	-200 MWh
Final Physical Notification (FPN _{ij})	-190 MWh
Metered Consumption (QM _{ij})	-165 MWh
Applicable Balancing Services Volume (QAS _{ij})	25 MWh
Transmission Loss Multiplier (TLM _{ij})	1.05
Bid Offer Acceptances	0 MWh

The credited energy volume QCE_{iajj} is determined in accordance with the Balancing and Settlement Code, section T, paragraph 4.5.1(b):

$$\begin{aligned}
 QCE_{iajj} &= QM_{ij} \times TLM_{ij} - \sum_a QCE_{iajj} \\
 &= -165 \text{ MWh} \times 1.05 - 0 \text{ MWh} \\
 &= -173.25 \text{ MWh}
 \end{aligned}$$

(where \sum_a is the sum over Energy Accounts of Subsidiary Parties – in this example it is assumed that all energy is credited to the lead party.)

The account credited energy volume QACE_{aj}, would be calculated in accordance with the Balancing and Settlement Code, section T, paragraph 4.6.1:

$$\begin{aligned}
 QACE_{aj} &= \sum_i QCE_{iajj} \\
 &= -173.25 \text{ MWh}
 \end{aligned}$$

The Balancing Services Volume is determined in accordance with the Balancing and Settlement Code, section T, paragraph 4.3.2:

$$\begin{aligned} \text{QBS}_{ij} &= \sum^n (\text{QAO}_{ij}^n + \text{QAB}_{ij}^n) + \text{QAS}_{ij} \\ &= 0 + 25 \text{ MWh} \end{aligned}$$

The Account Period Balancing Services volume is determined in accordance with the Balancing and Settlement Code, section T, paragraph 4.6.2:

$$\begin{aligned} \text{QABS}_{aj} &= \sum_i \text{QBS}_{ij} \times \text{TLM}_{ij} \\ &= 25 \text{ MWh} \times 1.05 \\ &= 26.25 \text{ MWh} \end{aligned}$$

The Account Energy Imbalance Volume (QAEI_{aj}) is determined in accordance with the Balancing and Settlement Code, section T, paragraph 4.6.3:

$$\begin{aligned} \text{QAEI}_{aj} &= \text{QACE}_{aj} - \text{QABS}_{aj} - \text{QABC}_{aj} \\ \text{QAEI}_{aj} &= -173.25 \text{ MWh} - 26.25 \text{ MWh} - (-200 \text{ MWh}) \\ &= 0.5 \text{ MWh} \end{aligned}$$

In this example, the account would receive a payment for 0.5 MWh at System Sell Price, in accordance with the Balancing and Settlement code, section T, paragraph 4.7.1.