

Appendix C

Balancing

Services

Adjustment Data

Methodology

Statement

Version Date: [~~22 January 2007~~]

Version Control

<u>Date</u>	<u>Version No.</u>	<u>Notes</u>
20.3.01	1.0	Initial version
10.4.01	1.1	Revision to include price adjusters for reserve option fees
24.9.01	1.2	Revision to incorporate implementation of P8 and P18 within the BSC. Effective in respect of Settlement Days from and including 25 September 2001
28.3.02	2.0	Revision to incorporate implementation of P48 within the BSC. Effective in respect of Settlement Days from and including 2 April 2002.
25.3.03	2.1	Revision to incorporate implementation of P74/P78 within the BSC. Effective in respect of Settlement Days from and including [Date to be coincident with P74/P78 Implementation]
24.10.03	3.0	Revision to amend the allocation of standing reserve option fees
28.11.03	3.1	Revision to incorporate changes associated with Maximum Generation Service.
01.01.05	3.2	Revisions to incorporate changes relating to BETTA
15.07.05	3.3	Revisions to incorporate changes as a result of CAP076: Treatment of System to Generating Intertripping Schemes
01.11.06	4.0	Revisions to incorporate changes as a result of BM Start-Up service

22.01.07	4.1	Revisions to update the Standing Reserve Weighting Factors and to clarify the treatment of Supplemental Standing Reserve in the BPA calculation
	<u>4.2</u>	<u>Revisions to incorporate Short Term Operating Reserve (STOR)</u>

This Statement has been developed in consultation with the Authority/Director. 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 any Relevant Balancing Services of a kind or under a mechanism which 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.

In the event that it is necessary to modify this Statement in advance of issuing an updated version of this document, then this will be done by issuing a supplement to this Statement.

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

http://www.nationalgridinfo.co.uk/balancing/mn_transmission.html

Alternatively a copy may be requested from:

National Grid
National Grid House
Warwick Technology Park
Gallows Hill
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CONTENTS

PART A Introduction

1. Purpose of Document

PART B Balancing Services Adjustment Data (BSAD)

1. Basis of Calculation
 - 1.1 Variables included in the BSAD
 - 1.2 Balancing Services contract costs for inclusion in the BSAD
 - 1.3 BSAD Provision
 - 1.4 Basis of BSAD
 - 1.5 Re-submission of BSAD

PART C BSAD Methodology

1. Principles
2. Worked Examples
 - 2.1 Example 1 – Reserve Services only
 - 2.2 Example 2 – Reserve Services and Forward Contracts purchased for Energy Balancing purposes
 - 2.3 Example 3 – Reserve Services and Forward Contracts purchased and sold for Energy Balancing purposes
 - 2.4 Example 4 – Reserve Services and Forward Contracts purchased and sold for Energy and System Balancing purposes

SCHEDULE 1 Allocation of ~~Standing~~Short Term Operating Reserve Option Fees

PART A: INTRODUCTION

1. Purpose of Document

This document sets out the Balancing Services Adjustment Data methodology which National Grid Electricity Transmission plc 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 Relevant Balancing Services that will be taken into account under the Balancing and Settlement Code for the purposes of determining Imbalance Price(s).

In the event that it is necessary to modify this Statement in advance of issuing an updated version of this document, then this will be done by issuing a supplement to this Statement.

This Statement has been developed in consultation with the Authority/Director. 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 any Relevant Balancing Services of a kind or under a mechanism which 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 and Balancing and Settlement Code. In the event that any of the relevant provisions in the Grid Code or 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 or 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 and/or the Balancing and Settlement Code as the case may be.

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PART B: BALANCING SERVICES ADJUSTMENT DATA ‘BSAD’

1. Basis of Calculation

1.1 Variables included in the BSAD

The BSAD is specified in Section Q, Paragraph 6.3 of the Balancing and Settlement Code and includes:

- (i) SBVA – Net Buy Price Volume Adjustment (System);
- (ii) SSVA – Net Sell Price Volume Adjustment (System);
- (iii) EBVA – Net Buy Price Volume Adjustment (Energy);
- (iv) ESVA – Net Sell Price Volume Adjustment (Energy);
- (v) EBCA – Net Buy Price Cost Adjustment (Energy);
- (vi) ESCA – Net Sell Price Cost Adjustment (Energy);
- (vii) BPA – Buy Price Price Adjustment; and
- (viii) SPA – Sell Price Price Adjustment.

This data is used in the calculation of Energy Imbalance Prices, System Buy Price (SBP) and the System Sell Price (SSP) as specified in Section T, Paragraphs 4.4.5 and 4.4.6 of the Balancing and Settlement Code. The summations of System Buy Price (SBP) and System Sell Price (SSP) are defined in BSC Paragraphs T4.4.5 and T4.4.6. NIV Tagged Accepted Offers and Bids, Arbitrage Tagged Accepted Offers and Bids, and Bid Offer Acceptances with an acceptance time of less than the Continuous Acceptance Duration Limit (CADL)¹ are excluded from the summations. The SBVA and SSVA will be used to determine the size of the appropriate bid/offer stack, and then be tagged out, and not used in the calculation of SBP or SSP

Where an implicit adjustment for Transmission Losses is not already included in the contracted volume for relevant services described in this Methodology Statement, National Grid will make the necessary adjustments for Transmission Losses by the application of a ex-ante Transmission Loss Multiplier. The values of $ETLMO_j^+$ and $ETLMO_j^-$ as

¹ CADL is a variable defined within the BSC. The value of CADL is determined by the BSC Panel. For information, the level of CADL as at 13 November 2003 was 15 minutes.

used by the Balancing Mechanism Reporting Agent will be used. This adjustment will be made prior to submission of the BSAD data.

1.2 Balancing Services contract costs for inclusion in the BSAD

Balancing Services are defined 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. BSAD covers a subset of the Balancing Services that we intend to procure.

The following relevant Balancing Services contracts will be included in the calculation of the BSAD:

- ~~Standing Reserve and Supplemental Standing Reserve~~ Short Term Operating Reserve (STOR) – In these contracts we will pay option fees either £/h or £/MWh for service availability during specific half-hour periods. Utilisation payments for participants within the Balancing Mechanism will be dealt with automatically via the BM and will feed into the energy imbalance price calculation via the acceptance of an Offer. Utilisation payments for non-BM participants will be made via a separate Balancing Services contract payment.

The calculation of BSAD will include the option fees paid to all service providers. ~~Standing Reserve and Supplemental Standing Reserve~~ STOR Option Fees feed into the calculation of BPA and will be allocated into specific settlement periods in accordance with the weighting factors set out in Schedule 1.

- **Regulating Reserve** – For firm provision of this service we will pay option fees with any utilisation fees being fixed via agreement of BM Offers.

Firm Regulating Reserve option payments for increasing generation or reducing demand will feed into the calculation of the BPA. This will be calculated by dividing the total option fee in any settlement period by the total contracted capability.

Similarly any option payments for reducing generation or increasing demand (negative reserve) will feed into the calculation of the SPA.

- **BM Start-Up**

The BM Start-Up service allows National Grid to access MW from BM Units that would not otherwise have run, and are unable to start-up within BM timescales on the day. Firm payments for this service are made on a £/h basis, to remunerate the costs of preparing a BMU to start up and synchronise within BM timescales.

The costs incurred in creating additional reserve availability will feed into the calculation of BPA, and will be allocated into the periods where the requirement exists (as identified by National Grid at the time of instruction). As National Grid's reserve requirements vary with lead-time, the accrual of costs will need to take account of the amount of reserve that these costs are being incurred to meet, at the relevant lead-time.

- **Maximum Generation**

This service is for a non-firm provision of energy, above MEL, called upon after gate closure. Contracts for Maximum Generation are utilisation based only. National Grid will estimate volume and associated cost of the service and will include this estimate in a re-submission of BSAD to the SAA for use in the calculation of the Interim Information Settlement Run. Actual energy delivered, and the

associated cost of provision, will not be known until QM_{ij} volumes, as defined within the BSC, are available following the Interim Information Run. National Grid will provide final volumes and costs associated with Maximum Generation Services as soon as practicable, but in any case prior to the Initial Settlement Run.

- **System to Generator Operational Intertripping**

This is a System Service that results, in certain circumstances, in the automatic tripping of Generating Unit(s). The contract details associated with a System to Generator Operational Intertripping Scheme are contained in section 4.2A of the CUSC and Appendix F3 of a generator's Bilateral Connection Agreement. The volume for inclusion in BSAD will be calculated as SE_{sj} in accordance with the methodology outlined within the ABSVD Methodology Statement, where service s is System to Generator Operational Intertripping.

- **Forward Contracts**

The costs and volumes of the following Balancing Services (as defined within the Procurement Guidelines) will also feed into the calculation of the BSAD variables:

- Energy Related Products
- PGB Transactions
- System-to-System services

These Balancing Services will be termed Forward Contracts in this document.

Each instance of these Forward Contracts will be categorised as 'energy' related or 'system' related, and this will dictate the treatment of each individual transaction.

In general, energy balancing action is non-locational, and is undertaken purely to ensure the ongoing matching of generation and demand. A system balancing action will generally be used to address very short term effects (less than the Continuous Acceptance Duration Limit) or be location specific (for example resolution of transmission constraints) or provision of frequency response.

System volumes will be targeted to the half-hours in which they are incurred/utilised. Energy costs and volumes will be targeted to the half-hours in which they are incurred/utilised.

For contracts covering bundled services, we will attempt to accurately identify the costs associated with each particular service. If this cannot be achieved then we will allocate the costs equally to each of the contracted services.

1.3 BSAD Provision

BSAD will be submitted in accordance with section Q, Paragraph 6.3 of the Balancing and Settlement Code. In outline this entails the submission of BSAD to the Balancing Mechanism Reporting Agent (BMRA) at or before 5pm each day to cover the 24 hour period from half-hour ending 00:30 to half-hour ending 24:00 for the following day. BSAD amendments for previous periods will also be included in the submission.

This initial submission of BSAD to the BMRA will include the eight variables SBVA, SSVA, EBVA, ESVA, EBCA, ESCA, BPA and SPA for each settlement period.

The costs and volumes of System to System services and Maximum Generation services will be included in a post event re-submission of BSAD as described in section 1.5.

BSAD will also be published on the National Grid Website.

BSAD will also be submitted on a reasonable endeavours basis to the BMRA on a half hourly basis as soon as possible after Gate Closure. In the event that the half hourly data is not available, then the day ahead submission will prevail.

1.4 Basis of BSAD

The calculation of the BSAD will be performed on the following basis:

- Reserve availability will be calculated on the basis of week ahead submissions of availability from service providers;
- If no week ahead submission is received from a service provider then zero availability of that contract will be assumed in the calculation of BPA; and
- Any forward contracts struck prior to the submission of BSAD at 5pm at the day-ahead stage will be included. Best endeavours will be employed to include all the contracts that have been entered into prior to 5pm.

1.5 Re-submission of BSAD

The BSAD will be re-submitted, if required, post event to cover:

- The correction of any errors in the original submission made at 5pm at the Day Ahead stage;
- Adjustments to any of the variables to account for any forward contracts entered into between the day ahead and real time that were not included in the original submission;

- Inclusion of any changes caused by the utilisation of contracts with ‘difference²’ payments;
- Inclusion of any System to System services; and
- Inclusion of any Maximum Generation Service volumes and payments.

Any of these circumstances could result in revisions to any of the variables within BSAD and hence SBP and SSP.

If re-submission of BSAD is required, for any of the reasons above, then National Grid will endeavour to do this in sufficient time to allow the revised variables to be included in the calculation of SSP and SBP in the Interim Information Settlement Run.

PART C: BSAD Methodology

1. Principles

As detailed in Part B, the variables associated with BSAD are as follows:

$SBVA = \max (\text{Aggregated volume of all relevant Balancing Services purchased for system balancing purposes} - \text{Aggregated volume of all relevant Balancing Services sold for system balancing purposes}, 0);$

$SSVA = \min (\text{Aggregated volume of all relevant Balancing Services purchased for system balancing purposes} - \text{Aggregated volume of all relevant Balancing Services sold for system balancing purposes}, 0);$

² A ‘difference’ payment will occur if the contract allows a service provider to offer prices into the Balancing Mechanism at any level, but if the contract is exercised then the provider is paid at a fixed

EBVA = max (Aggregated volume of all relevant Balancing Services purchased for energy balancing purposes – Aggregated volume of all relevant Balancing Services sold for energy balancing purposes, 0);

ESVA = min (Aggregated volume of all relevant Balancing Services purchased for energy balancing purposes – Aggregated volume of all relevant Balancing Services sold for energy balancing purposes, 0);

EBCA = EBVA * weighted average price³ of all relevant Balancing Services purchased and sold for energy balancing purposes;

ESCA = ESVA * weighted average price³ of all relevant Balancing Services purchased and sold for energy balancing purposes;

BPA = [((Aggregated cost of purchases of ~~standing reserve and supplemental standing reserve~~ STOR option fees for the relevant day * (relevant ~~standing reserve~~ STOR weighting factor as contained in Schedule 1)) + Aggregated cost of purchases of firm regulating reserve option fees + Aggregated cost of purchases of Forward Contract option fees) / (MWh capability of ~~standing reserve and supplemental standing reserve~~ STOR contracts purchased + MWh capability of firm regulating reserve contracts purchased + Contracted MWh associated with options for Forward Contracts purchased)] +

$$\sum_{t \in \{BMStartUp\ time\}} \frac{BMStartUp\ Cost}{BMStartUp\ Volume}^4$$

level. The difference payment will result from the difference between the BM payment and the contract payment and this will feed into the cost terms of BSAD as appropriate.

$$^3 \text{Weighted average price} = \frac{\sum_{i=1}^n (|volume_i| * price_i)}{\sum_{i=1}^n |volume_i|}$$

Where the summations (i=1 to n) are performed against all the energy balancing actions (either purchases or sales).

⁴BM StartUp time = all minutes associated with BM Start-Ups instructed for this BPA period
 BM StartUp Cost (£) = Total cost of applicable BM Start-ups instructed for this BPA period during minute t associated with a requirement defined by National Grid

BM StartUp volume (MWh) = Total capacity (MW) of applicable BM Start-ups instructed for this BPA period during minute t multiplied by the number of hours associated with a requirement defined by National Grid;

SPA = (Aggregated cost of negative reserve option fees + Aggregated cost of sales of Forward Contract option fees) / (Aggregated volume of negative reserve contracts + Contracted MWh associated with options for Forward Contracts sold)

For the avoidance of doubt, if the denominator of BPA or SPA is zero in any settlement period, then BPA or SPA will be set to zero in that period.

2. **Worked Examples**

Four examples are given below of how the variables of BSAD are calculated in different situations.

These examples show the following situations:

Example 1: Reserve Services only are in place;

Example 2: Reserve Services are in place, and Forward Contracts have been purchased for energy balancing purposes;

Example 3: Reserve Services are in place, and Forward Contracts have been purchased and sold for energy balancing purposes, and

Example 4: Reserve Services are in place, and Forward Contracts have been purchased and sold for energy and system balancing purposes.

Any necessary adjustments for Transmission Losses are already included in the volume terms in the examples.

The prices included in these examples are illustrative only and are provided to demonstrate the way in which the BSAD variables are calculated.

2.1 **Example 1 - ~~Standing~~ STOR & Regulating Reserve Service only**

Assumptions for a given Settlement Period:

- ~~Standing reserve~~ STOR contracts
 - Total ~~standing reserve~~ STOR option payments for the day £1000
 - ~~Standing reserve~~ STOR weighting factor ~~that for~~ the settlement period 0.06
 - Declared ~~standing reserve~~ STOR capability for the settlement period 35MW
- The following Firm Regulating Reserve contracts are in place,
 - Contract C
 - Option Fee (Price £ per hour) £10 per hour;
 - Contracted Capability 5MW
- No Forward Contracts have been purchased;
- No Forward Contracts have been sold;
- SBVA = max (Aggregated volume of all relevant Balancing Services purchased for system balancing purposes – Aggregated volume of all relevant Balancing Services sold for system balancing purposes, 0)
= 0 MWh;
- SSVA = min (Aggregated volume of all relevant Balancing Services purchased for system balancing purposes – Aggregated volume of all relevant Balancing Services sold for system balancing purposes, 0)
= 0 MWh;
- EBVA = max (Aggregated volume of all relevant Balancing Services purchased for energy balancing purposes– Aggregated volume of all relevant Balancing Services sold for energy balancing purposes, 0)
= 0 MWh;

- ESVA = min (Aggregated volume of all relevant Balancing Services purchased for energy balancing purposes – Aggregated volume of all relevant Balancing Services sold for energy balancing purposes, 0)
= 0 MWh
- EBCA = EBVA * weighted average price of all relevant Balancing Services purchased and sold for energy balancing purposes
= £0
- ESCA = ESVA * weighted average price of all relevant Balancing Services purchased and sold for energy balancing purposes
= £0
- BPA = ((Aggregated cost of purchases of ~~standing reserve and supplemental standing reserve~~ STOR option fees for the relevant day * (relevant ~~standing reserve~~ STOR weighting factor as contained in Schedule 1)) + Aggregated cost of purchases of firm regulating reserve option fees + Aggregated cost of purchases of Forward Contract option fees) / (MWh capability of ~~standing reserve and supplemental standing reserve~~ STOR contracts purchased + MWh capability of firm regulating reserve contracts purchased + Contracted MWh associated with options for Forward Contracts purchased)
= ((£1000*0.06) + 10 £/hr) / (35MW + 5 MW)
= (£60 + £5)/(20MWh) in that settlement period
= £ 3.25/MWh
- SPA = (Aggregated cost of negative reserve option fees + Aggregated cost of sales of Forward Contract option fees) / (Aggregated volume of negative reserve contracts + Contracted MWh associated with options for Forward Contracts sold)
= £0/MWh

2.2 Example 2 - ~~Standing~~ STOR & Firm Regulating Reserve Service and Forward Contracts purchased for Energy Balancing purposes

Assumptions for a given Settlement Period:

- ~~Standing reserve~~ STOR contracts
 - Total ~~standing reserve~~ STOR option payments for the day £1000
 - ~~Standing reserve~~ STOR weighting factor that for the settlement period 0.06
 - Declared ~~standing reserve~~ STOR capability for the settlement period 35MW
- The following Firm Regulating Reserve contracts are in place,
 - Contract C

Option Fee (Price £ per hour)	£10 per hour;
Contracted Capability	5MW
- Forward Contracts have been purchased for energy balancing purposes;
 - Contract D

Contract for 500MW at £20/MWh for 10 hours,
Total payment is therefore £100,000, or £5,000 per settlement period. Contracting party reflects the 500MW in his physical notification.
 - Contract E

Option Fee over 20 settlement periods of £5,000 to utilise 200MW at £18/MWh. Contract is exercised pre-gate closure for all 20 periods;
- No Forward Contracts have been sold;
- $SBVA = \max (\text{Aggregated volume of all relevant Balancing Services purchased for system balancing purposes} - \text{Aggregated volume of all relevant Balancing Services sold for system balancing purposes}, 0)$
=0 MWh;

- SSVA = min (Aggregated volume of all relevant Balancing Services purchased for system balancing purposes – Aggregated volume of all relevant Balancing Services sold for system balancing purposes, 0)
= 0 MWh;
 - EBVA = max (Aggregated volume of all relevant Balancing Services purchased for energy balancing purposes – Aggregated volume of all relevant Balancing Services sold for energy balancing purposes, 0)
= (500MW +200MW)/2 = 350 MWh;
 - ESVA = min (Aggregated volume of all relevant Balancing Services purchased for energy balancing purposes – Aggregated volume of all relevant Balancing Services sold for energy balancing purposes, 0)
= 0 MWh;
 - EBCA = EBVA * weighted average price of all relevant Balancing Services purchased and sold for energy balancing purposes
= 350 * ((500 MW * £20/MWh) +(200 MW *£18/MWh))/700MW = £6,800;
 - ESCA = ESVA * weighted average price of all relevant Balancing Services purchased and sold for energy balancing purposes
= £0;
- ;
- BPA = ((Aggregated cost of purchases of ~~standing reserve and supplemental standing reserve~~ [STOR](#) option fees for the relevant day * (relevant ~~standing reserve~~ [STOR](#) weighting factor as contained in Schedule 1)) + Aggregated cost of purchases of firm regulating reserve option fees + Aggregated cost of purchases of Forward Contract option fees) / (MWh capability of ~~standing reserve and supplemental standing reserve~~ [STOR](#) contracts purchased + MWh capability of firm regulating reserve contracts purchased + Contracted MWh associated with options for Forward Contracts purchased)

$$= ((£1000*0.06) + 10 \text{ £/hr} + 500 \text{ £/hr}) / (35\text{MW} + 5 \text{ MW} + 200\text{MW})$$

$$=(£60 + £5 + £250)/(120\text{MWh}) \text{ for that settlement period}$$

$$= \text{£ } 2.625/\text{MWh}$$

- SPA = (Aggregated cost of negative reserve option fees + Aggregated cost of sales of Forward Contract option fees) / (Aggregated volume of negative reserve contracts + Contracted MWh associated with options for Forward Contracts sold)
= £0/MWh

2.3 Example 3 - ~~Standing reserve~~STOR & Firm Regulating Reserve Service and Forward Contracts Purchased and Sold for Energy Balancing Purposes

Assumptions for a given Settlement Period:

- ~~Standing reserve~~STOR contracts
Total ~~standing reserve~~STOR option payments for the day £1000
~~Standing reserve~~STOR weighting factor that for the settlement period 0.06
Declared ~~standing reserve~~STOR capability for the settlement period 35MW
- The following Firm Regulating Reserve contracts are in place,
Contract C
Option Fee (Price £ per hour) £10 per hour;
Contracted Capability 5MW
- Forward Contracts have been purchased for energy balancing purposes;
Contract D
Contract for 500MW at £20/MWh for 10 hours,

Total payment is therefore £100,000, or £5,000 per settlement period. Contracting party reflects the 500MW in his physical notification.

Contract E

Option Fee over 20 settlement periods of £5,000 to utilise 200MW at £18/MWh (Call Option to buy). Contract is exercised pre-gate closure for all 20 periods;

- Forward Contracts have been sold for energy balancing purposes;

Contract F

Option Fee over 15 settlement periods of £3000 to utilise 300MW at £17/MWh (Put Option to sell). Contract is exercised pre-gate closure for all 15 periods;

- SBVA = max (Aggregated volume of all relevant Balancing Services purchased for system balancing purposes – Aggregated volume of all relevant Balancing Services sold for system balancing purposes, 0)

$$= 0 \text{ MWh};$$

- SSVA = min (Aggregated volume of all relevant Balancing Services purchased for system balancing purposes – Aggregated volume of all relevant Balancing Services sold for system balancing purposes, 0)

$$= 0 \text{ MWh};$$

- EBVA = max (Aggregated volume of all relevant Balancing Services purchased for energy balancing purposes – Aggregated volume of all relevant Balancing Services sold for energy balancing purposes, 0)

$$= (500 \text{ MW} + 200 \text{ MW} - 300 \text{ MW})/2 = 200 \text{ MWh};$$

- ESVA = min (Aggregated volume of all relevant Balancing Services purchased for energy balancing purposes – Aggregated volume of all relevant Balancing Services sold for energy balancing purposes, 0)

$$= \min (((700\text{MW} - 300\text{MW})/2), 0)$$

$$= 0 \text{ MWh};$$

- EBCA = EBVA * weighted average price of all relevant Balancing Services purchased and sold for energy balancing purposes

$$= 200 * ((500\text{MW} * £20/\text{MWh}) + (200\text{MW} * £18/\text{MWh}) + (300\text{MW} * £17/\text{MWh})) / (500\text{MW} + 200\text{MW} + 300\text{MW}) = £3740;$$
- ESCA = ESVA * weighted average price of all relevant Balancing Services purchased and sold for energy balancing purposes

$$= £ 0;$$
- BPA = ((Aggregated cost of purchases of ~~standing reserve and supplemental standing reserve~~ STOR option fees for the relevant day * (relevant ~~standing reserve~~ STOR weighting factor as contained in Schedule 1)) + Aggregated cost of purchases of firm regulating reserve option fees + Aggregated cost of purchases of Forward Contract option fees) / (MWh capability of ~~standing reserve and supplemental standing reserve~~ STOR contracts purchased + MWh capability of firm regulating reserve contracts purchased + Contracted MWh associated with options for Forward Contracts purchased)

$$= ((£1000 * 0.06) + 10 £/\text{hr} + 500 £/\text{hr}) / (35\text{MW} + 5\text{MW} + 200\text{MW})$$

$$= (£60 + £5 + £250) / (120\text{MWh}) \text{ for that settlement period}$$

$$= £ 2.625/\text{MWh};$$
- SPA = (Aggregated cost of negative reserve option fees + Aggregated cost of sales of forward contract option fees) / (Aggregated volume of negative reserve contracts + Contracted MWh associated with options for Forward Contracts sold)

$$= £400/\text{hr} / 300\text{MW} = £1.333/\text{MWh};$$

2.4 **Example 4 - ~~Standing~~ STOR & Firm Regulating Reserve Service and Forward Contracts Purchased and Sold for both Energy and System Balancing purposes**

Assumptions for a given Settlement Period:

- ~~Standing reserve~~ STOR contracts

Total ~~standing reserve~~ STOR option payments for the day
£1000

~~Standing reserve~~ STOR weighting factor ~~that~~ for the settlement
period 0.06

Declared ~~standing reserve~~ STOR capability for the settlement
period

35MW

- The following Firm Regulating Reserve contracts are in place,

Contract C

Option Fee (Price £ per hour) £10 per hour;

Contracted Capability 5MW

- Forward Contracts have been purchased for energy balancing purposes;

Contract D

Contract for 500MW at £20/MWh for 10 hours,

Total payment is therefore £100,000, or £5,000 per settlement period. Contracting party reflects the 500MW in his physical notification.

Contract E

Option Fee over 20 settlement periods of £5,000 to utilise 200MW at £18/MWh (Call Option to buy). Contract is exercised pre-gate closure for all 20 periods;

- Forward contracts have been sold for energy balancing purposes;

Contract F

Option Fee over 15 settlement periods of £3000 to utilise 300MW at £17/MWh (Put Option to sell). Contract is exercised pre-gate closure for all 15 periods;

- Forward contracts have been purchased for system balancing purposes;

Contract G

PGB Transaction of 200 MW;

Contract H

PGB Transaction of 300 MW;

Contract I

System to System flow of 150 MW;

- Forward Contracts have been sold for system balancing purposes;

Contract J

PGB Transaction of 90 MW;

Contract K

PGB Transaction of 100 MW;

Contract L

PGB Transaction of 80 MW;

Contract M

System to System flow of 400 MW;

- BM Start-Up contracts are in place. Instructions have been issued on two contracts 'N' and 'O'. Instruction on contract 'N' has proceeded to term but the instruction on contract 'O' has been cancelled prior to synchronisation. These instructions have been issued for a 2 hour period of service requirement.

Contract N

BM Start-Up rate = £1,000 / hr

Relevant NDZ = 8 hr

MEL = 600 MW

Contract O

BM Start-Up rate = £2,000 / hr

Relevant NDZ = 6 hr

MEL = 400 MW

- SBVA = max (Aggregated volume of all relevant Balancing Services purchased for system balancing purposes – Aggregated volume of all relevant Balancing Services sold for system balancing purposes, 0)

$$= \max(((650\text{MW} - 670\text{MW})/2), 0)$$

$$= 0 \text{ MWh};$$

- SSVA = min (Aggregated volume of all relevant Balancing Services purchased for system balancing purposes – Aggregated volume of all relevant Balancing Services sold for system balancing purposes, 0)

$$= (200\text{MW} + 300\text{MW} + 150\text{MW} - 90\text{MW} - 100\text{MW} - 80\text{MW} - 400\text{MW}) / 2 = -10 \text{ MWh};$$

- EBVA = max (Aggregated volume of all relevant Balancing Services purchased for energy balancing purposes – Aggregated volume of all relevant Balancing Services sold for energy balancing purposes, 0)

$$= (500 \text{ MW} + 200 \text{ MW} - 300 \text{ MW})/2 = 200 \text{ MWh};$$

- ESVA = min (Aggregated volume of all relevant Balancing Services purchased for energy balancing purposes – Aggregated volume of all relevant Balancing Services sold for energy balancing purposes, 0)

$$= \min (((700\text{MW} - 300\text{MW})/2), 0)$$

$$= 0 \text{ MWh};$$

- EBVA * weighted average price of all relevant Balancing Services purchased and sold for energy balancing purposes

$$= 200 * ((500\text{MW} * £20/\text{MWh}) + (200\text{MW} * £18/\text{MWh}) + (300\text{MW} * £17/\text{MWh})) / (500\text{MW} + 200 \text{ MW} + 300\text{MW}) = £3740;$$

- ESCA = ESVA * weighted average price of all relevant Balancing Services purchased and sold for energy balancing purposes

$$= £ 0;$$

- BPA = [((Aggregated cost of purchases of ~~standing reserve and supplemental standing reserve~~ [STOR](#) option fees for the relevant day * (relevant ~~standing reserve~~ [STOR](#) weighting factor as contained in Schedule 1)) + Aggregated cost of purchases of firm regulating reserve option fees + Aggregated cost of purchases of Forward Contract option fees) / (MWh capability of ~~standing reserve and supplemental standing reserve~~ [STOR](#) contracts purchased + MWh

capability of firm regulating reserve contracts purchased + Contracted MWh associated with options for Forward Contracts

$$\text{purchased)]} + \sum_{t \in \{\text{BMStartUp time}\}} \frac{\text{BMStartUp Cost}}{\text{BMStartUp Volume}}^5$$

$$\begin{aligned}
 &= ((£1000 * 0.06) + 10 \text{ £/hr} + 500 \text{ £/hr}) / (35\text{MW} + 5 \text{ MW} + \\
 &200\text{MW}) + [2\text{hrs} * (1,000\text{£/hr} / 1200\text{MWh}) + (5\text{hrs} * (3,000\text{£/hr} / \\
 &2000\text{MWh}))] \\
 &= (£60 + £5 + £250) / (120\text{MWh}) + (2\text{hrs} * £0.83/\text{MWh} + 5\text{hrs} \\
 &* £1.5/\text{MWh}) \text{ for that settlement period} \\
 &= (£315 / 120 \text{ MWh}) + (£1.67/\text{MWh} + £7.5/\text{MWh}) \\
 &= £ 2.333/\text{MWh} + £ 9.17 / \text{MWh} \\
 &= £ 11.50/ \text{MWh};
 \end{aligned}$$

- SPA = (Aggregated cost of negative reserve option fees + Aggregated cost of sales of Forward Contract option fees) / (Aggregated volume of negative reserve contracts + Contracted MWh associated with options for Forward Contracts sold)
= £400/hr/300MW = £1.333/MWh;

⁵ BM StartUp time = all minutes associated with BM Start-Ups instructed for this BPA period
 BM StartUp Cost (£) = Total cost of applicable BM Start-ups instructed for this BPA period during minute t associated with a requirement defined by National Grid
 BM StartUp volume (MWh) = Total capacity (MW) of applicable BM Start-ups instructed for this BPA period during minute t multiplied by the number of hours associated with a requirement defined by National Grid;

Schedule1 - **Standing Reserve** **Short Term Operating Reserve (STOR)** Weighting Factors

Settlement Period 'j'	1 st Apr – 5 th Jun		5 th Jun – 4 th Sep		4 th Sep – 29 th Oct		29 th Oct – 5 th Feb		5 th Feb – 25 th Mar		25 th Mar – 1 st Apr	
	WD1	NWD1	WD2	NWD2	WD3	NWD3	WD4	NWD4	WD5	NWD5	WD6	NWD6
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	0.0658	0.0000	0.0153	0.0000	0.0247	0.0000	0.0421	0.0000	0.0475	0.0000	0.0658	0.0000
16	0.0767	0.0000	0.0127	0.0000	0.0348	0.0000	0.0494	0.0000	0.0236	0.0000	0.0767	0.0000
17	0.0549	0.0000	0.0347	0.0000	0.0332	0.0000	0.0388	0.0000	0.0317	0.0000	0.0549	0.0000
18	0.0272	0.0000	0.0246	0.0000	0.0230	0.0000	0.0236	0.0000	0.0382	0.0000	0.0272	0.0000
19	0.0396	0.0000	0.0391	0.0023	0.0369	0.0000	0.0410	0.0000	0.0682	0.0000	0.0396	0.0000
20	0.0429	0.0000	0.0439	0.0146	0.0419	0.0000	0.0302	0.0000	0.0733	0.0000	0.0429	0.0000
21	0.0365	0.0163	0.0560	0.0305	0.0421	0.0064	0.0347	0.0000	0.0574	0.1390	0.0365	0.0163
22	0.0541	0.0644	0.0610	0.0171	0.0452	0.0100	0.0364	0.0000	0.0519	0.0908	0.0541	0.0644
23	0.0673	0.0768	0.0628	0.0479	0.0463	0.0137	0.0373	0.0741	0.0555	0.0663	0.0673	0.0768
24	0.0496	0.0686	0.0696	0.0745	0.0529	0.0332	0.0351	0.0765	0.0358	0.0589	0.0496	0.0686
25	0.0525	0.1100	0.0783	0.1378	0.0450	0.0520	0.0380	0.0959	0.0329	0.0865	0.0525	0.1100
26	0.0361	0.0921	0.0662	0.1046	0.0304	0.0566	0.0356	0.0868	0.0299	0.1189	0.0361	0.0921
27	0.0000	0.0791	0.0703	0.1357	0.0332	0.0000	0.0315	0.0806	0.0282	0.0000	0.0000	0.0791
28	0.0000	0.0378	0.0677	0.0000	0.0201	0.0000	0.0247	0.0000	0.0294	0.0000	0.0000	0.0378
29	0.0000	0.0326	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0326
30	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
31	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
32	0.0000	0.0000	0.0322	0.0000	0.0000	0.0000	0.0152	0.0000	0.0000	0.0000	0.0000	0.0000
33	0.0187	0.0000	0.0225	0.0000	0.0283	0.0000	0.0322	0.0465	0.0000	0.0000	0.0187	0.0000
34	0.0431	0.0199	0.0319	0.0000	0.0472	0.0000	0.0624	0.0967	0.0191	0.0000	0.0431	0.0199
35	0.0447	0.0209	0.0222	0.0000	0.0444	0.0000	0.0872	0.1425	0.0360	0.0602	0.0447	0.0209
36	0.0325	0.0375	0.0213	0.0000	0.0452	0.0110	0.0709	0.1078	0.0532	0.0643	0.0325	0.0375
37	0.0115	0.0352	0.0000	0.0082	0.0591	0.0627	0.0531	0.0776	0.0845	0.1082	0.0115	0.0352
38	0.0069	0.0000	0.0000	0.0105	0.0771	0.1275	0.0309	0.0310	0.0826	0.0697	0.0069	0.0000
39	0.0246	0.0000	0.0000	0.0325	0.0794	0.1586	0.0344	0.0468	0.0723	0.0740	0.0246	0.0000
40	0.0518	0.0587	0.0209	0.0276	0.0577	0.2027	0.0361	0.0371	0.0485	0.0630	0.0518	0.0587
41	0.0690	0.0840	0.0265	0.0421	0.0520	0.0889	0.0477	0.0000	0.0000	0.0000	0.0690	0.0840
42	0.0401	0.0513	0.0289	0.0655	0.0000	0.0861	0.0315	0.0000	0.0000	0.0000	0.0401	0.0513
43	0.0537	0.0624	0.0404	0.1029	0.0000	0.0907	0.0000	0.0000	0.0000	0.0000	0.0537	0.0624
44	0.0000	0.0524	0.0187	0.0441	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0524
45	0.0000	0.0000	0.0323	0.0631	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
46	0.0000	0.0000	0.0000	0.0384	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
47	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
48	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<i>SUM</i>	<i>1.0000</i>	<i>1.0000</i>	<i>1.0000</i>	<i>1.0000</i>	<i>1.0000</i>	<i>1.0000</i>	<i>1.0000</i>	<i>1.0000</i>	<i>1.0000</i>	<i>1.0000</i>	<i>1.0000</i>	<i>1.0000</i>

