

# Appendix E

**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	<b>Revisions to update the Standing Reserve Weighting Factors and to clarify the treatment of Supplemental Standing Reserve in the BPA calculation</b>
	<u><a href="#">4.2</a></u>	<u><a href="#">Revisions to incorporate Short Term Operating Reserve (STOR) and to publish STOR weighting factors on National Grid's industry information website</a></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](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  
Warwick CV34 6DA

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## **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.

The latest version of this document is available electronically from the National Grid Website;

[http://www.nationalgridinfo.co.uk/balancing/mn\\_transmission.html](http://www.nationalgridinfo.co.uk/balancing/mn_transmission.html)

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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)<sup>1</sup> 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

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<sup>1</sup> 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 4~~ Part D.

- **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 ‘difference<sup>2</sup>’ 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:

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

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

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<sup>2</sup> 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 price<sup>3</sup> of all relevant Balancing Services purchased and sold for energy balancing purposes;

ESCA = ESVA \* weighted average price<sup>3</sup> 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 set out~~ in Schedule 1 Part D)) + 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).

<sup>4</sup>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;

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

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 set out~~ in Schedule 1 Part D)) + 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 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 set out~~ in [Schedule 1 Part D](#))) + 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 the settlement period 0.06  
Declared ~~standing reserve~~STOR capability for the settlement period 35MW
- The following Firm Regulating Reserve contracts are in place,
 

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

<u>Contract D</u>	
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 set out~~ in ~~Schedule 1 Part D~~)) + 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 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'. Instructions on contracts 'N' ~~has~~ have 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 set out~~ in [Schedule 1 Part D](#))) + 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

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

$$\begin{aligned}
 &= ((£1000 * 0.06) + 10 \text{ £/hr} + 500 \text{ £/hr}) / (35\text{MW} + 5 \text{ MW} + \\
 &200\text{MW}) + \cancel{[2\text{hrs} * (1,000\text{£/hr} / 1200\text{MWh}) + (5\text{hrs} * (3,000\text{£/hr} / \\
 &2000\text{MWh}))]} \underline{[(2\text{hrs} * £1,000/\text{hr}) / (600\text{MW} * 2 \text{ hrs}) + (6\text{hrs} * \\
 &£3,000/\text{hr}) / (1,000\text{MW} * 2\text{hrs})]} \\
 &= (£60 + £5 + £250) / (120\text{MWh}) + \underline{£2,000 / 1,200\text{MWh} +} \\
 &\underline{£18,000 / 2,000\text{MWh}} \cancel{(2\text{hrs} * £0.83/\text{MWh} + 5\text{hrs} * £1.5/\text{MWh})} \text{ for} \\
 &\text{that settlement period} \\
 &= (£315 / 120 \text{ MWh}) + (£1.67/\text{MWh} + £7.59/\text{MWh}) \\
 &= £ 2.3363/\text{MWh} + £ 9.4710.67 / \text{MWh} \\
 &= £ 11.5013.30 / \text{MWh};
 \end{aligned}$$

- 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;

<sup>5</sup> 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;

## PART D: Calculation and Publication of Short Term Operating Reserve (STOR) Weighting Factors

### 1. Introduction

The calculation of BPA uses a set of weighting factors to allocate daily Short Term Operating Reserve (STOR) availability fees into settlement periods within the day. This Part describes the methodology for calculating these weighting factors.

The purpose of the weighting factors is to allocate reserve availability costs into availability windows according to the likely pattern of utilisation, determined from previous experience of reserve utilisation.

### 2. Key Steps in the Calculation of the Weighting Factors

National Grid will calculate the weighting factors as described below:

- a) As part of the STOR service, National Grid will set out the seasons and availability windows as follows:
  - i. The current year will be divided into seasons in order to cater for the varying reserve utilisation pattern across the year. The duration of each season may change from time to time and National Grid will publish this information on its industry information website (<http://www.nationalgrid.com/uk/Electricity/Balancing/tenderreports/>).
  - ii. Each season will be divided into Working Days (including Saturdays) and Non-working Days (Sundays and most Bank Holidays) in order to account for the varying reserve utilisation pattern within the week. Each day type (Working Day, Non-working Day) will be further divided into periods ('Availability Windows') of likely reserve utilisation; the Availability Windows will form the basis for allocating the weighted costs of STOR option fees.
- b) National Grid will compile the data on STOR utilisation from the previous year in order to determine a pattern of likely utilisation for the current year (1 April - 31 March); this data will consist of delivery of reserve from both BM and Non-BM Units where availability was procured to provide the STOR service.
  - i. For avoidance of doubt, National Grid will use the historical data associated with Standing Reserve and Supplemental Standing Reserve utilisation in 2006-07 in order to determine the STOR weighting factors for 2007-08. After implementation of the STOR

service, National Grid will use historical data associated with STOR utilisation.

- c) The STOR data from the previous year will be categorised by season and by day type. For example, for 6 seasons and 2 day types, there will be 12 categories (season / day type combinations) of STOR data.
- d) For a given category in the current year, an aggregate STOR volume (MWh) will be determined for a given settlement period, which will be the sum of the STOR utilisation volumes (MWh) from all such settlement periods in the relevant category from the previous year. For example, the aggregate STOR volume for settlement period 1 for Working Days in season 1 will be the sum of STOR volumes in the first settlement period of all Working Days in season 1. Similarly, the aggregate STOR volumes will be determined for the remaining settlement periods in order to determine the volumetric utilisation profile for a given season and day type combination.
- e) The process outlined in item (e) will be repeated for the remaining categories, resulting in one volumetric profile for each season and day type combination. For example, for 6 seasons and 2 day types, there will be 12 such profiles.
- f) Each volumetric profile will be superimposed on the relevant Availability Windows for the current year (step a(ii)). In order to ensure 100% cost allocation within the Availability Windows, any volumetric data falling outside the Availability Windows will be set to zero.
- i. If no historical utilisation data exists for one or more settlement periods within the Availability Window for the current year, the volumetric data for such settlement period(s) will be set to zero.
- ii. If no historical utilisation data exists in the entire window (e.g. if a new availability window is introduced), National Grid will take into account historical utilisation of other balancing services and assess its appropriateness in the calculation of the weighting factors.
- g) For each volumetric profile, the volume ( $V_j$ ) of STOR utilised in each settlement period 'j' (within the Availability Windows for the current year) will be added together to determine the total volume ( $V_T$ ) of STOR utilised within the day.
- h) The weighting factor ( $WF_j$ ) for each settlement period 'j' within the day will be derived as:

$$WF_j (\%) = V_j / V_T * 100$$

- i) Steps (g) and (h) will be repeated for each season, resulting in two sets of weighting factors ( $WF_{wd_j}$  for working days and  $WF_{nwd_j}$  for non-working days) for the relevant season. A general form of the output from this process (for one season) is shown in Table 1 below. Table 1 also shows that, for each day type, the weighting factors will add up to 100% thus ensuring 100% allocation of the daily STOR option fees.

Table 1  
Format for Weighting Factors

<u>Settlement Period</u>	<u>Weighting Factors for Season 1</u>	
	<u>Working Days (%)</u>	<u>Non-Working Days (%)</u>
<u>1</u>	<u>WFwd<sub>1</sub></u>	<u>WFnwd<sub>1</sub></u>
<u>2</u>	<u>WFwd<sub>2</sub></u>	<u>WFnwd<sub>2</sub></u>
<u>3</u>	<u>WFwd<sub>3</sub></u>	<u>WFnwd<sub>3</sub></u>
<u>4</u>	<u>WFwd<sub>4</sub></u>	<u>WFnwd<sub>4</sub></u>
<u>5</u>	<u>WFwd<sub>5</sub></u>	<u>WFnwd<sub>5</sub></u>
<u>6</u>	<u>WFwd<sub>6</sub></u>	<u>WFnwd<sub>6</sub></u>
<u>7</u>	<u>WFwd<sub>7</sub></u>	<u>WFnwd<sub>7</sub></u>
<u>8</u>	<u>WFwd<sub>8</sub></u>	<u>WFnwd<sub>8</sub></u>
<u>9</u>	<u>WFwd<sub>9</sub></u>	<u>WFnwd<sub>9</sub></u>
<u>10</u>	<u>WFwd<sub>10</sub></u>	<u>WFnwd<sub>10</sub></u>
<u>11</u>	<u>WFwd<sub>11</sub></u>	<u>WFnwd<sub>11</sub></u>
<u>12</u>	<u>WFwd<sub>12</sub></u>	<u>WFnwd<sub>12</sub></u>
<u>13</u>	<u>WFwd<sub>13</sub></u>	<u>WFnwd<sub>13</sub></u>
<u>14</u>	<u>WFwd<sub>14</sub></u>	<u>WFnwd<sub>14</sub></u>
<u>15</u>	<u>WFwd<sub>15</sub></u>	<u>WFnwd<sub>15</sub></u>
<u>16</u>	<u>WFwd<sub>16</sub></u>	<u>WFnwd<sub>16</sub></u>
<u>17</u>	<u>WFwd<sub>17</sub></u>	<u>WFnwd<sub>17</sub></u>
<u>18</u>	<u>WFwd<sub>18</sub></u>	<u>WFnwd<sub>18</sub></u>
<u>19</u>	<u>WFwd<sub>19</sub></u>	<u>WFnwd<sub>19</sub></u>
<u>20</u>	<u>WFwd<sub>20</sub></u>	<u>WFnwd<sub>20</sub></u>
<u>21</u>	<u>WFwd<sub>21</sub></u>	<u>WFnwd<sub>21</sub></u>
<u>22</u>	<u>WFwd<sub>22</sub></u>	<u>WFnwd<sub>22</sub></u>
<u>23</u>	<u>WFwd<sub>23</sub></u>	<u>WFnwd<sub>23</sub></u>
<u>24</u>	<u>WFwd<sub>24</sub></u>	<u>WFnwd<sub>24</sub></u>
<u>25</u>	<u>WFwd<sub>25</sub></u>	<u>WFnwd<sub>25</sub></u>
<u>26</u>	<u>WFwd<sub>26</sub></u>	<u>WFnwd<sub>26</sub></u>
<u>27</u>	<u>WFwd<sub>27</sub></u>	<u>WFnwd<sub>27</sub></u>
<u>28</u>	<u>WFwd<sub>28</sub></u>	<u>WFnwd<sub>28</sub></u>
<u>29</u>	<u>WFwd<sub>29</sub></u>	<u>WFnwd<sub>29</sub></u>
<u>30</u>	<u>WFwd<sub>30</sub></u>	<u>WFnwd<sub>30</sub></u>
<u>31</u>	<u>WFwd<sub>31</sub></u>	<u>WFnwd<sub>31</sub></u>
<u>32</u>	<u>WFwd<sub>32</sub></u>	<u>WFnwd<sub>32</sub></u>
<u>33</u>	<u>WFwd<sub>33</sub></u>	<u>WFnwd<sub>33</sub></u>
<u>34</u>	<u>WFwd<sub>34</sub></u>	<u>WFnwd<sub>34</sub></u>
<u>35</u>	<u>WFwd<sub>35</sub></u>	<u>WFnwd<sub>35</sub></u>
<u>36</u>	<u>WFwd<sub>36</sub></u>	<u>WFnwd<sub>36</sub></u>
<u>37</u>	<u>WFwd<sub>37</sub></u>	<u>WFnwd<sub>37</sub></u>
<u>38</u>	<u>WFwd<sub>38</sub></u>	<u>WFnwd<sub>38</sub></u>
<u>39</u>	<u>WFwd<sub>39</sub></u>	<u>WFnwd<sub>39</sub></u>
<u>40</u>	<u>WFwd<sub>40</sub></u>	<u>WFnwd<sub>40</sub></u>
<u>41</u>	<u>WFwd<sub>41</sub></u>	<u>WFnwd<sub>41</sub></u>
<u>42</u>	<u>WFwd<sub>42</sub></u>	<u>WFnwd<sub>42</sub></u>
<u>43</u>	<u>WFwd<sub>43</sub></u>	<u>WFnwd<sub>43</sub></u>
<u>44</u>	<u>WFwd<sub>44</sub></u>	<u>WFnwd<sub>44</sub></u>
<u>45</u>	<u>WFwd<sub>45</sub></u>	<u>WFnwd<sub>45</sub></u>
<u>46</u>	<u>WFwd<sub>46</sub></u>	<u>WFnwd<sub>46</sub></u>
<u>47</u>	<u>WFwd<sub>47</sub></u>	<u>WFnwd<sub>47</sub></u>
<u>48</u>	<u>WFwd<sub>48</sub></u>	<u>WFnwd<sub>48</sub></u>
<b>Total</b>	<b>100%</b>	<b>100%</b>

- j) A complete set of weighting factors for all seasons and day types will be derived, and summarised, in a similar format to Table 1.
- k) National Grid will endeavour to update the weighting factors on a rolling basis using previous year's STOR utilisation data. However, the timing and frequency of updates will depend on the availability of previous year's STOR utilisation data.
- l) National Grid will update the weighting factors periodically in order to ensure that they reflect the changes in utilisation pattern, and will endeavour to do so at least one month in advance of the relevant season

to which the weighting factors apply. For example, for the seasons falling in the period from April to October in a given year, the weighting factors will be updated by the end of February in the same calendar year, and, for the seasons falling in the period from October to April, the weighting factors will be updated by the end of August.

m) In exceptional circumstances, if the weighting factors have not been revised, National Grid will use the prevailing weighting factors for the calculation of BPA.

### **3. Publication of the Weighting Factors**

i. National Grid will publish the weighting factors on its industry information web site (<http://www.nationalgrid.com/uk/Electricity/Balancing/>) as soon as these are available. The timing of publication of the weighting factors will depend on the availability of the historical data used in the determination of the weighting factors.

ii. The weighting factors will be published at least one month in advance of the relevant seasons to which the weighting factors apply.

# Schedule1—Standing Reserve Weighting Factors

Settlement Period-j	1 <sup>st</sup> Apr—5 <sup>th</sup> Jun		5 <sup>th</sup> Jun—4 <sup>th</sup> Sep		4 <sup>th</sup> Sep—29 <sup>th</sup> Oct		29 <sup>th</sup> Oct—5 <sup>th</sup> Feb		5 <sup>th</sup> Feb—25 <sup>th</sup> Mar		25 <sup>th</sup> Mar—1 <sup>st</sup> 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	0.0394	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	0.0544	0.0644	0.0640	0.0171	0.0452	0.0100	0.0364	0.0000	0.0519	0.0908	0.0544	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	0.0924	0.0662	0.1046	0.0304	0.0566	0.0356	0.0868	0.0209	0.1189	0.0361	0.0924
27	0.0000	0.0794	0.0703	0.1357	0.0332	0.0000	0.0315	0.0806	0.0282	0.0000	0.0000	0.0794
28	0.0000	0.0378	0.0677	0.0000	0.0204	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	0.0434	0.0199	0.0319	0.0000	0.0472	0.0000	0.0624	0.0967	0.0194	0.0000	0.0434	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	0.0774	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	0.0404	0.0513	0.0289	0.0655	0.0000	0.0861	0.0315	0.0000	0.0000	0.0000	0.0404	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	0.0634	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
SUM	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

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