Section 2 – The Statement of the Balancing Services Use of System Charging Methodology

14.29 Principles

14.29.1 The Transmission Licence allows The Company to derive revenue in respect of the Balancing Services Activity through the Balancing Services Use of System (BSUoS) charges. This statement explains the methodology used in order to calculate the BSUoS charges.

14.29.2 The Balancing Services Activity is defined in the Transmission Licence as the activity undertaken by The Company as part of the Transmission Business including the operation of the transmission system and the procuring and using of Balancing Services for the purpose of balancing the transmission system.

14.29.3 The Company in its role as System Operator keeps the electricity system in balance (energy balancing) and maintains the quality and security of supply (system balancing). The Company is incentivised on the procurement and utilisation of services to maintain the energy and system balance and other costs associated with operating the system. Users pay for the cost of these services and any incentivised payment/receipts through the BSUoS charge.

14.29.4 All CUSC Parties acting as Generators and Suppliers (for the avoidance of doubt excluding all BMUs and Trading Units associated with Interconnectors) are liable for Balancing Services Use of System charges based on their energy taken from or supplied to the National Grid system in each half-hour Settlement Period.

14.29.5 BSUoS charges comprise the following costs:

(i) The Total Costs of the Balancing Mechanism
(ii) Total Balancing Services Contract costs
(iii) Payments/Receipts from National Grid incentive schemes
(iv) Internal costs of operating the System
(v) Costs associated with contracting for and developing Balancing Services
(vi) Adjustments
(vii) Costs invoiced to The Company associated with Manifest Errors and Special Provisions.
(viii) BETTA implementation costs

14.30 Calculation of the Daily Balancing Services Use of System charge

Calculation of the Daily Balancing Services Use of System charge

14.30.1 The BSUoS charge payable by customer c, on Settlement Day d, will be calculated in accordance with the following formula:

$$BSUoSTOT_{cd} = \sum_{i \in c} \sum_{j \in d} BSUoSTOT_{ij}$$

Where:

i - refers to the individual BM Unit

j - refers to an individual Settlement Period

$\sum_{i \in c} \sum_{j \in d}$ - refers to the sum over all BM units 'i', for which customer 'c' is the Lead Party* summed over all Settlement Periods 'j' on a Settlement Day 'd'

14.30.2 A customer's charge is based on their proportion of BM Unit Metered Volume for each Settlement Period relative to the total BM Unit Metered Volume for each Settlement Period, adjusted for transmission losses by the application of the relevant Transmission Losses Multiplier.

For all liable importing and exporting BM Units in delivering Trading Units in a Settlement Period:

$$BSUoSTOT_{ij} = \frac{BSUoSTOT_j * QMBSUoS_{ij} * TLM_{ij}}{\left\{\left|\sum^{+}(QMBSUoS_{ij} * TLM_{ij})\right| + \left|\sum^{-}(QMBSUoS_{ij} * TLM_{ij})\right|\right\}}$$

For all liable importing and exporting BM Units in offtaking Trading Units in a Settlement Period:

$$BSUoSTOT_{ij} = \frac{-1 * BSUoSTOT_j * QMBSUoS_{ij} * TLM_{ij}}{\left\{\left|\sum^{+}(QMBSUoS_{ij} * TLM_{ij})\right| + \left|\sum^{-}(QMBSUoS_{ij} * TLM_{ij})\right|\right\}}$$

Where:

$BSUoSTOT_j$	Total BSUoS Charge applicable for Settlement Period j
$QMBSUoS_{ij}$	BM Unit Metered Volume (QM_{ij})** for BSUoS Liable BM Units
TLM_{ij}	Transmission Loss Multiplier **

$\sum^{+}$ - refers to the sum over all BM Units that are in delivering Trading Units in Settlement Period 'j'

$\sum^{-}$ - refers to the sum over all BM Units that are in offtaking Trading Units in Settlement Period 'j'

'delivering' and 'offtaking' in relation to Trading Units have the meaning set out in the Balancing and Settlement Code (excluding all Interconnector BMUs and Trading Units)

* or CUSC party associated with the BMUnits (listed in Appendix C of the BEGA) who is exempt from also being a BSC Party

** Detailed definition in Balancing and Settlement Code Annex X2 – Technical Glossary

14.30.3 For the avoidance of doubt, BM Units that are registered in Trading Units will be charged on a net Trading Unit basis i.e. if a BM Unit is exporting to the system and is within a Trading Unit that is offtaking from the system then the BM Unit in essence would be paid the BSUoS charge. Conversely, if a BM Unit is importing from the system in a delivering Trading Unit then the BM Unit in essence would pay the BSUoS charge.

Interconnector BM Units

14.30.4 BM Unit and Trading Units associated with Interconnectors, including those associated with the Interconnector Error Administrator, are not liable for BSUoS charges.

Total BSUoS Charge (Internal + External) for each Settlement Period ($BSUoSTOT_{jd}$)

14.30.5 The Total BSUoS charges for each Settlement Period ($BSUoSTOT_{jd}$) for a particular day are calculated by summing the external BSUoS charge ($BSUoSEXT_{jd}$) and internal BSUoS charge ($BSUoSINT_{jd}$) for each Settlement Period.

$$BSUoSTOT_{jd} = BSUoSEXT_{jd} + BSUoSINT_{jd}$$

External BSUoS Charge for each Settlement Period ($BSUoSEXT_{jd}$)

14.30.6 The External BSUoS Charges for each Settlement Period ($BSUoSEXT_{jd}$) are calculated by taking each Settlement Period System Operator BM Cash Flow ($CSOBM_j$) and Balancing Service Variable Contract Cost ($BSCCV_j$) and allocating the daily elements on a MWh basis across each Settlement Period in a day.

Comment [A1]: Need to amend equation below to remove LBS and FIIR and replace IncpayEXTd with IncPayExtd

$$BSUoSEXT_{jd} = CSOBM_{jd} + BSCCV_{jd}$$
$$+\left[(IncpayEXT_d + BSCCA_d + ET_d - OM_d + FIIR_d + BSC_d + SOTOC_d + LBS_d) \right.$$
$$*\left\{ \left| \sum\nolimits^{+} (QMBSUoS_{ijd} * TLM_{ijd}) + \left| \sum\nolimits^{-} (QMBSUoS_{ijd} * TLM_{ijd}) \right| \right\} /$$
$$\left. \sum_{j \in d} \left\{ \left| \sum\nolimits^{+} (QMBSUoS_{ij} * TLM_{ij}) \right| + \left| \sum\nolimits^{-} (QMBSUoS_{ij} * TLM_{ij}) \right| \right\} \right]$$

Calculation of the daily External Incentive Payment ~~($IncpayEXT_d$)~~ ($IncPayExt_d$)

14.30.7 $IncPayExt_t$ is the external incentive payment for the Current **Financial Year**. This amount of this will be determined in line with Transmission Licence Special Condition 4M.

14.30.8 For **Financial Year** 2018/19 $IncPayExt_d$ is calculated by dividing $IncPayExt_t$ for **Financial Year** 2018/19 by the amount of days remaining within the current incentive scheme year. $IncPayExt_d$ will be evenly spread and then apportioned by volume as per the current process (14.30.2).

~~14.30.7 In respect of each Settlement Day d, IncpayEXTd is calculated as the difference between the new total incentive payment (FKIncpayEXTd) and the~~

~~incentive payment that has been made to date for the previous days from the commencement of the scheme ($\sum_{k=1=d-1}$IncpayEXTk):~~

$$\overline{IncpayEXT_d = FKIncpayEXT_d - \sum_{k=0}^{d-1} IncpayEXT_k}$$

~~14.30.8 The forecast incentive payment made to date (from the commencement of the scheme) ($FKIncpayEXT_d$) is calculated as the ratio of total forecast external incentive payment across the duration of the scheme: the number of days in the scheme, multiplied by the sum of the profiling factors to date.~~

$$\overline{FKIncpayEXT_d = \frac{FYIncpayEXT_d}{NDS} * \sum_{k=1}^{d} PFT_k}$$

~~Inclusion of Profiling Factors~~

~~14.30.9 Profiling factors have been included to give an effective mechanism for calculating a representative level of the incentive payments to/from The Company according to the time of year. All PFT_d are assumed to be one for the duration of the current external incentive scheme.~~

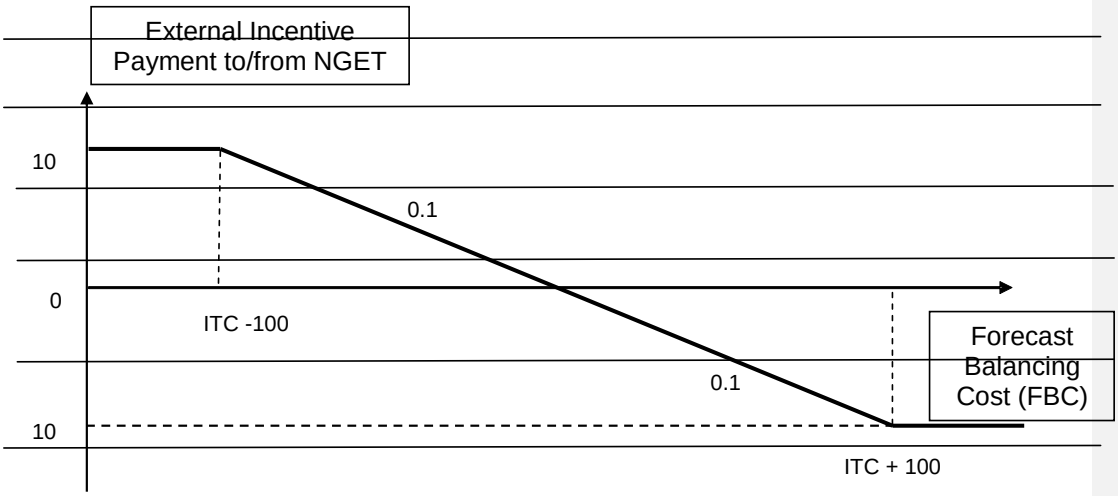
~~14.30.10 The forecast External incentive payment for the duration of the External incentive scheme ($FYIncpayEXT_d$) is calculated as the difference between the External Scheme target (M_t) and the forecast Balancing cost (FBC) subject to sharing factors (SF_t) and a cap/collar (CB_t).~~

$$\overline{FYIncpayEXT_d = SF_t * (M_t - FBC_d) + CB_t}$$

~~14.30.11 The relevant value of the External incentive payment (BSUoSEXT) can then be calculated by reference to Table 9.1 and the selection and application of the appropriate sharing factors and offset dependent upon the value of the forecast Balancing Services cost (FBC).~~

Table 9.1

Forecast Balancing Cost (FBC)	M_t £m	SF_t	CB_t £m
FBC < (Incentive Target Cost – 100)	0	0	10
(Incentive Target Cost -100) <= FBC < (Incentive Target Cost)	Incentive Target Cost	10	0
Incentive Target Cost = FBC	FBC	0	0
(Incentive Target Cost) < FBC <= (Incentive Target Cost + 100)	Incentive Target Cost	10	0
(Incentive Target Cost + 100)	0	0	10



14.30.9 In respect of each Settlement Day d, the forecast incentivised Balancing Cost (FBC_d) will be calculated as follows:

$$FBC_d = \frac{\sum_{k=1}^{d} IBC_k}{\sum_{k=1}^{d} PFT_k} * NDS$$

Where:

NDS = Number of days in Scheme.

14.30.10 Daily Incentivised Balancing Cost (IBC_d) is calculated as follows:

Internal BSUoS Charge for each Settlement Period ($BSUoSINT_{jd}$)

14.30.10 The Internal BSUoS Charges ($BSUoSINT_{jd}$) for each Settlement Period j for a particular day are calculated by taking the incentivised and non-incentivised SO Internal Costs for each Settlement Day allocated on a MWh basis across each Settlement Period in a day.

$$BSUoSINT_{jd} = \left[(SOPU_d + SOMOD_d + SOEMR_d + SOEMRCO_d + SOTRU_d) * RPIF_t\right]$$
$$* \left\{ \left| \sum^{+} (QMBSUoS_{ijd} * TLM_{ijd}) \right| + \left| \sum^{-} (QMBSUoS_{ijd} * TLM_{ijd}) \right| \right\}$$
$$/ \sum_{j \in d} \left\{ \left| \sum^{+} (QMBSUoS_{ij} * TLM_{ij}) \right| + \left| \sum^{-} (QMBSUoS_{ij} * TLM_{ij}) \right| \right\}$$

Inclusion of Profiling Factors

14.30.11 Profiling factors have been included to give an effective mechanism for calculating a representative level of the incentive payments to/from The Company according to the time of year. All PFT_k are assumed to be one for the duration of the current external incentive scheme

14.31 Settlement of BSUoS

Settlement and Reconciliation of BSUoS charges

14.31.1 There are two stages of the reconciliation of BSUoS charges described below:

- Initial Settlement (SF)
- Final Reconciliation (RF)

Initial Settlement of BSUoS

14.31.2 The Company will calculate initial settlement (SF) BSUoS charges in accordance with the methodology set out in section 14.30 above, using the latest available data, including data from the Initial Settlement Run and the Initial Volume Allocation Run.

Reconciliation of BSUoS Charges

14.31.3 Final Reconciliation will result in the calculation of a reconciled charge for each settlement day in the scheme year. The Company will calculate Final Reconciliation (RF) BSUoS charges (with the inclusion of interest as defined in the CUSC) in accordance with the methodology set out in section 14.30 above, using the latest available data, including data from the Final Reconciliation Settlement Run and the Final Reconciliation Volume Allocation Run.

Unavailability of Data

14.31.4 If any of the elements required to calculate the BSUoS charges in respect of any Settlement Day have not been notified to The Company in time for it to do the calculations then The Company will use data for the corresponding

Settlement Day in the previous week. If no such values for the previous week are available to The Company then The Company will substitute such variables as it shall, at its reasonable discretion, think fit and calculate Balancing Services Use of System charges on the basis of these values. When the actual data becomes available a reconciliation run will be undertaken.

Disputes

14.31.5 If The Company or any customer identifies any error which would affect the total Balancing Services Use of System charge on a Settlement Day then The Company will recalculate the charges following resolution of the error. Revised invoices and/or credit notes will be issued for the change in charges, plus interest as set out in the CUSC. The charge recalculation and issuing of revised invoices and/or credit notes will not take place for any day where the total change in the Balancing Services charge is less than £2000.

Relationship between the Statement of the Use of System Charging Methodology and the Transmission Licence

14.31.6 BSUoS charges are made on a daily basis and as such of this Statement sets out the details of the calculation of such charges on a daily basis. Customers may, when verifying charges for Balancing Services Use of System refer to the Transmission Licence which sets out the maximum allowed revenue that The Company may recover in respect of the Balancing Services Activity.

14.31.7 The Company has, where possible and appropriate, attempted to ensure that acronyms allocated to variables within the Balancing Services charging software, and associated reporting, match with the acronyms given to those variables used within this statement.

14.31.8 Balancing Services Use of System Acronym Definitions

For the avoidance of doubt "as defined in the BSC" relates to the Balancing and Settlement Code as published from time to time.

EXPRESSION	ACRONYM	Unit	Definition
BETTA Preparation Costs	BI	£	As defined in the Transmission Licence
Balancing Mechanism Unit	BM Unit or BMU		As defined in the BSC
Black Start Costs	BSC	£	As defined in the Transmission Licence (means he allowed revenue from and associated with Black Start services in accordance with paragraph 4G.5 of Special Condition 4G (Black Start Allowed Revenue Cost Incentive))
Balancing service contract costs – non-Settlement Period specific	$BSCCA_d$	£	Non Settlement Period specific Balancing Contract Costs for settlement day d less any costs incurred within these values relating to Supplementary Balancing Reserve and Demand Side Balancing Reserve
Balancing Service Contract Cost	$BSCC_j$	£	Balancing Service Contract Cost from purchasing Ancillary services applicable to a Settlement Period j less any costs incurred within these values relating to Supplementary Balancing Reserve and Demand Side Balancing Reserve
Balancing service contract costs – Settlement Period specific	$BSCCV_{jd}$	£	Settlement Period j specific Balancing Contract Costs for settlement day d l~~ess any costs incurred within these values relating to Supplementary Balancing Reserve and Demand Side Balancing Reserve~~
External Balancing Services Use of System charge	$BSUoSEXT_{jd}$	£	External System Operator (SO) Balancing Services Use of System charge applicable to Settlement Period j for settlement day d
Internal Balancing Services Use of System charge	$BSUoSINT_{jd}$	£	Internal System Operator (SO) Balancing Services Use of System charge applicable to Settlement Period j for settlement day d
Total Balancing Services Use of System charge	$BSUoSTOT_{cd}$	£	The sum determined for each customer, c, in accordance with this Statement and payable by that customer in respect of each Settlement Day d, in accordance with the terms of the Supplemental Agreement
Total Balancing Services Use of System charge	$BSUoSTOT_j$	£	Total Balancing Services Use of System Charge applicable for Settlement Period j

EXPRESSION	ACRONYM	Unit	Definition
System Operator BM Cash Flow	$CSOBM_j$	£	As defined in the Balancing and Settlement Code in force immediately prior to 1 April 2001 less any costs incurred within these values relating to Supplementary Balancing Reserve and Demand Side Balancing Reserve
Daily balancing services adjustment	ET_d	£	Is the contribution on Settlement Day, d, to the value of ET_t where ET_t is determined pursuant to part B of Special Condition 4C of the Transmission Licence
Forecast incentivised Balancing Cost	FBC_d	£	Forecast incentivised Balancing Cost for duration of the Incentive Scheme as at settlement day d
~~SO Forecasting Incentive Payment~~	~~FIIR~~	~~£~~	~~As defined in the Transmission Licence~~ ~~(means the incentive payment which the licensee may derive from the forecasting incentive for Wind Generation Output and National Demand Wind Generation Forecasting Incentive in accordance with Special Condition 4H (Wind Generation Forecasting Incentive))~~
~~External Incentive payment to date~~	~~$FKIncpayEXT_d$~~	~~£~~	~~Total External Incentive Payment to date up to and including settlement day d~~
~~Total Forecast External incentive payment~~	~~$FYIncpayEXT_d$~~	~~£~~	~~Total forecast External incentive payment for the entire duration of the incentive scheme as at settlement day d~~
Allowed Income Adjustment relating to the SO-TO Code	IAT	£	As defined in the Transmission Licence
~~Daily Incentivised Balancing Cost~~	~~IBC_d~~	~~£~~	~~Is equal to that value calculated in accordance with paragraph 14.30.10 of Part 2 of this Statement~~
External incentive payment	$IncPayExt_t$	£	As defined in the Transmission Licence.
Daily incentive payment	~~$IncpayEXT_d$~~ $IncPayExt_d$	£	External Incentive payment for Settlement Day d
~~Demand Side Balancing Reserve and Supplementary Balancing Reserve costs~~	~~LBS~~	~~£~~	~~As defined in the Transmission Licence~~
Cost associated with the Provision of Balancing Services to others	OM_d	£	Is the contribution on Settlement Day, d, to the value of OM_t where OM_t is determined pursuant to part 2 of Condition AA5A of the Transmission Licence

EXPRESSION	ACRONYM	Unit	Definition
Outage change allowance amount	ON	£	As defined in the Transmission Licence
~~Incentivised Balancing Cost daily profiling factor~~	~~PFT_d~~		~~The daily profiling factor used in the determination of forecast Incentivised Balancing Cost for settlement day d~~
BM Unit Metered Volume	QM_{ij}	MWh	As defined in the BSC
BSUoS Liable BM Unit Metered Volume	$QMBSUoS_{ij}$	MWh	QM_{ij} for all BM Units liable for BSUoS
Retail Price Index Adjustment Factor	RPIF		As defined in the Transmission Licence
Balancing services deemed costs	RT_d	£	Is the contribution on Settlement Day, d, to the value of RT_t where RT_t is determined pursuant to part 2 of Condition AA5A of the Transmission Licence
SOEMR Preparation Costs	SOEMR	£	As defined in the Transmission Licence
SOEMR Preparation Costs Adjustment	SOEMRCO	£	As defined in the Transmission Licence
Incremental change from SO Opening Base Revenue Allowance	SOMOD		As defined in the Transmission Licence
SO Opening Base Revenue Allowance	SOPU		As defined in the Transmission Licence
SO-TO funding allowance	SOTOC	£	As defined in the Transmission Licence (means the SO-TO Mechanism cost allowance calculated in accordance with 4C.29 Special Condition 4J (SO-TO Mechanism))
Revenue Adjustment with respect to actual and assumed RPI values	SOTRU		As defined in the Transmission Licence
Tax Allowance	T	£	As defined in the Transmission Licence
Transmission Loss Multiplier	TLM_{ij}		As defined in the BSC

EXPRESSION	ACRONYM	Unit	Definition
Total System Energy Imbalance Volume	$TQEI_j$	MWh	As defined in the Balancing and Settlement Code in force immediately prior to 1 April 2001
Final Reconciliation Settlement Run			As defined in the BSC
Final Reconciliation Volume Allocation Run			As defined in the BSC
Initial Settlement Run			As defined in the BSC
Initial Volume Allocation Run			As defined in the BSC
Lead Party			As defined in the BSC

14.32 Examples of Balancing Services Use of System (BSUoS) Daily Charge Calculations

Comment [A2]: Remove this whole section (could not strikethrough some equations).

This example illustrates the operation of the Balancing Services Use of System Daily charge formula. The parameters used are for illustrative purposes only and have been chosen for ease of calculation. They do not relate to the agreed scheme for any particular year. The actual scheme parameters are shown in the main text.

The example is divided into the calculation of the External System Operator cost and Internal System Operator cost elements. All daily profiling factors (PFT_d) have been assumed to be one for this example.

Day 1

Calculation of the Daily External SO Incentive Scheme Payment

The first step is to calculate the Daily Incentivised Balancing Cost (IBC_1 for day one) for that day using the following formula. These are the daily incentivised cost elements used to calculate the external SO incentive payment.

$$IBC_1 = CSOBM_1 + BSCCA_1 + BSCCV_1 - OM_1 - RT_1$$

$$= £800,000 + £500,000 + £250,000 - £0 - £0$$

$$= £1,550,000$$

Assuming that $CSOBM_1$ = £800,000
$BSCCA_1$ = £500,000
$BSCCV_1$ = £250,000
OM_1 = £0
RT_1 = £0

~~Now that we know IBC_1, it is possible to calculate Forecast Balancing Services Cost (FBC_1) from that day's outturn as follows:~~

$$FBC_1 = \frac{\sum_{k=1}^{d=1} IBC_k}{\sum_{k=1}^{d=1} PFT_k} * NDS$$

$$= \frac{£1{,}550{,}000}{1} * 365$$

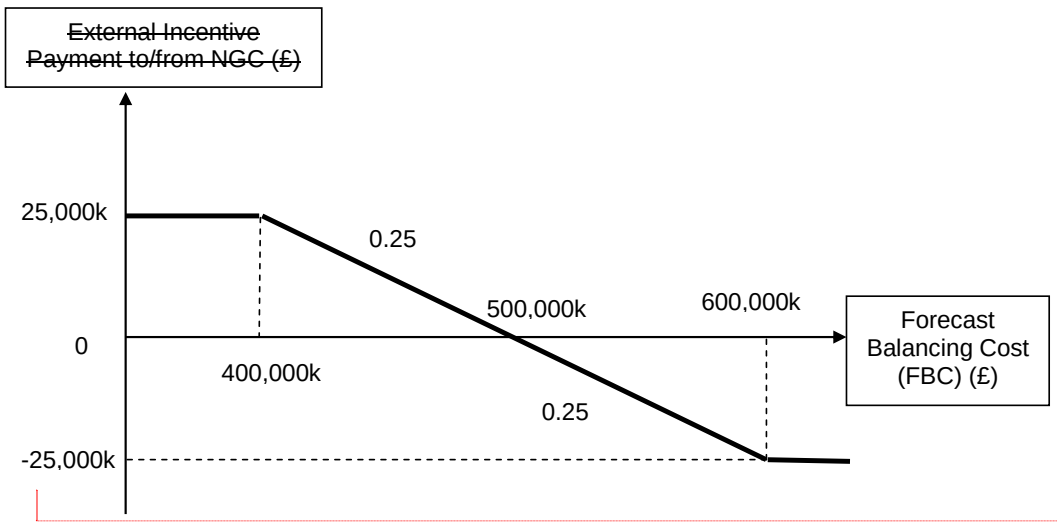
$$= £565{,}750{,}000$$

~~The values of SF_t and CB_t can now be read off table BS1 below. (**These values are used purely for illustrative purposes based on an incentive target of £500,000,000**). As FBC_1 is £565,750,000, SF_t is 0.25, CB_t is £0 and M_t is £500,000,000.~~

~~Table BS1~~

~~Forecast Balancing Cost (FBC_d)~~	**~~M_t~~**	**~~SF_t~~**	**~~CB_t~~**
~~£400,000,000 < FBC~~	~~£0~~	~~0~~	~~£25,000,000~~
~~£400,000,000 <= FBC < £500,000,000~~	~~£500,000,000~~	~~0.25~~	~~£0~~
~~FBC = £500,000,000~~	~~£500,000,000~~	~~0~~	~~£0~~
~~£500,000,000 < FBC <= £600,000,000~~	~~£500,000,000~~	~~0.25~~	~~£0~~
~~FBC > £600,000,000~~	~~£0~~	~~0~~	~~- £25,000,000~~

~~The table describes the external incentive scheme, which can also be illustrated by the graph below.~~



Comment [A3]: Remove this diagram.

Using the values set out in the table above, the external SO incentive payment for the duration of the scheme (FYIncpayEXT) can be calculated as follows:

$$FYIncpayEXT_1 = SF_t * (M_t - FBC_1) + CB_t$$
$$= 0.25 * (£500{,}000{,}000 - £565{,}750{,}000) + £0$$
$$= -£16{,}437{,}500$$

In this case the incentive payment is negative (-£16,437,500) i.e. a payment from The Company.

The external SO incentive payment for the entire duration of the incentive scheme (FYincpayEXT) is then used to calculate the total incentive payment to date (FKIncpayEXT), shown as follows:

$$FKIncpayEXT_1 = \frac{FYIncpayEXT_1}{NDS} * \sum_{k=1}^{d=1} PFT_k$$
$$= \frac{-£16{,}437{,}500}{365} * 1$$
$$= -£45{,}034$$

Where:

NDS = Number of days in the external incentive scheme

The final step is to calculate today's external incentive payment ($IncpayEXT_1$ for day one), shown as follows:

$$IncpayEXT_1 = FKIncpayEXT_1 - \sum_{k=0}^{d-1=0} IncpayEXT_k$$
$$= -£45{,}034 - £0$$
$$= -£45{,}034$$

Calculating the External Balancing Services Use of System (BSUoS) charge for a Settlement Period j

The External Balancing Services Use of System (BSUoS) charge for Settlement Period 1 on this Settlement Day 1 can now be calculated using the following formula:

$$BSUoSEXT_{jd} = CSOBM_{jd} + BSCCV_{jd}$$
$$+ [\ (IncpayEXT_d + BSCCA_d + ET_d - OM_d + FIIR_d + BSC_d + SOTOC_d + LBS_d)$$
$$* \{\ \left|\sum^{+}(QM_{i1,1} * TLM_{i1,1}) + \left|\sum^{-}(QM_{i1,1} * TLM_{i1,1})\right|\ \}/$$
$$\sum_{j \in 1} \{\ \left|\sum^{+}(QM_{ij} * TLM_{ij})\ \right| + \left|\sum^{-}(QM_{ij} * TLM_{ij})\right|\ \}\ ]$$

For simplicity, the BSUoS applicable BM Unit Metered Volume ($QMBSUoS_{ij} * TLM_{ij}$) is assumed to be the same in all half hour Settlement Periods in a Settlement Day. Therefore the daily BSUoS charge will be evenly allocated to each Settlement Period (1/48) i.e. the multiplier at the end of the equation.

The illustration below shows the external BSUoS charge ($BSUoSEXT_{11}$) for Settlement Period one of Settlement Day 1.

~~The costs of the external SO Settlement Period variables are as follows (these are the daily values included in the IBC_t equation divided by 48 Settlement Periods).~~

~~CSOBM = £16,667~~
~~BSCCV = £5,208~~
~~$FIIR_t$, BSC_t, $SOTOC_t$, and LBS_t are all zero.~~

~~The costs of the external SO Settlement Day variables are as follows:~~

~~IncpayEXT = £-45,034~~
~~BSCCA = £500,000~~
~~ET = £0~~
~~OM = £0~~

$$BSUoSEXT_{11} = £16,667 + £5,208 + [(-£45,034 + £500,000 + £0 - £0 + £0 + £0 + £0)/48]$$
$$= £16,667 + £5,208 + £9,478$$
$$= £31,353$$

~~Calculating the Internal Balancing Services Use of System (BSUoS) charge for a Settlement Period j~~

~~Table BS2 below shows the annual Internal SO costs assumed for this example:~~

~~Table BS2~~

~~Internal SO Cost Variable~~	~~Annual Cost (£m)~~
~~$SOPU_t$~~	~~75,873,280~~
~~$SOMOD_t$~~	~~18,250,000~~
~~$SOEMR_t$~~	~~0~~
~~$SOEMRCO_t$~~	~~0~~
~~$SOTRU_t$~~	~~18,250,000~~

~~$RPIF_t = 1$~~

~~The Internal Balancing Services Use of System (BSUoS) charge for a Settlement Period 1 of Settlement Day 1 can be calculated using the following formula:~~

$$BSUoSINT_{11} = \left[\left\{(SOPU_1 + SOMOD_1 + SOEMR_1 + SOEMRCO_1 + SOTRU_1)/NDS\right\} * RPIF_1\right]$$
$$* \left\{ \left| \sum\nolimits^{+} (QM_{i1,1} * TLM_{i1,1}) \right| + \left| \sum\nolimits^{-} (QM_{i1,1} * TLM_{i1,1}) \right| \right\} / \sum_{j \in 1} \left\{ \left| \sum\nolimits^{+} (QM_{ij} * TLM_{ij}) \right| + \left| \sum\nolimits^{-} (QM_{ij} * TLM_{ij}) \right| \right\}$$

~~As with the external BSUoS charge, for simplicity, the BSUoS applicable BM Unit Metered Volume ($QMBSUoS_{ij}$ * TLM_{ij}) is assumed to be the same in all half hour Settlement Periods in a Settlement Day. Therefore the daily BSUoS charge will be evenly allocated to each Settlement Period (1/48).~~

$$BSUoSINT_{11} = \left[(75{,}873{,}280 + 18{,}250{,}000 + 0 + 0 + 18{,}250{,}000)/365\right] * 1/48$$
$$= £6414$$

~~Calculating the Total Balancing Services Use of System (BSUoS) charge for a Settlement Period 1~~

~~The final step is to calculate the Total Balancing Services Use of System ($BSUoSTOT_{11}$) for a Settlement Period 1 on Settlement Day 1.~~

$$BSUoSTOT_{11} = BSUoSEXT_{11} + BSUoSINT_{11}$$
~~$$= £31{,}353 + £6{,}414$$~~
$$= £37{,}767$$

~~Day 2~~

~~Calculation of the Daily External SO Incentive Scheme Payment~~

~~Again, the first step is to calculate the Daily Incentivised Balancing Cost for day 2 (IBC_2) using the following formula:~~

$$IBC_2 = CSOBM_2 + BSCCA_2 + BSCCV_2 - OM_2 - RT_2$$

$$= £600,000 + £150,000 + £100,000 - £0 - £0$$

$$= £850,000$$

~~Assuming that $CSOBM_2$ = £600,000~~
~~$BSCCA_2$ = £150,000~~
~~$BSCCV_2$ = £100,000~~
~~OM_2 = £0~~
~~RT_2 = £0~~

~~With IBC_d known for day one, it is possible to calculate Forecast Balancing Services Cost (FBC_2) from the outturn to date as follows:~~

$$FBC_2 = \frac{\sum_{k=1}^{d=2} IBC_k}{\sum_{k=1}^{d=2} PFT_k} * NDS$$

$$= \frac{(£1,550,000 + £850,000)}{2} * 365$$

$$= £438,000,000$$

~~The values of SF_t, M_t and CB_t can now be read off table BS1 given previously. As FBC_2 is £438,000,000, SF_t is now 0.25, M_t is £500,000,000 and CB_t is 0, calculated as follows:~~

$$FYIncpayEXT_2 = SF_t * (M_t - FBC_2) + CB_t$$

~~$= 0.25 * (£500,000,000 - £438,000,000) + £0$~~

$$= £15,500,000$$

~~The external SO incentive payment for the entire duration of the incentive scheme ($FYIncpayEXT_2$) is then used to calculate the total incentive payment to date ($FKIncpayEXT_2$), shown as follows:~~

$$FKIncpayEXT_2 = \frac{FYIncpayEXT_2}{NDS} * \sum_{k=1}^{d=2} PFT_k$$
$$= \frac{£15{,}500{,}000}{365} * 2$$
$$= £84{,}932$$

~~Where:~~

~~NDS = Number of days in the incentive scheme~~

~~In this case the incentive payment forecast for the year is £84,932.~~

~~Again, the final step is to calculate today's external incentive payment ($IncpayEXT_2$ for day two), shown as follows:~~

$$IncpayEXT_2 = FKIncpayEXT_2 - \sum_{k=0}^{d-1=1} IncpayEXT_k$$
$$= £84{,}932 - -£45{,}034$$
$$= £129{,}966$$

~~The costs of the external SO Settlement Period variables are as follows:~~

~~CSOBM = £12,500~~
~~BSCCV = £2,083~~

~~$FIIR_2$, BSC_2, $SOTOC_2$ and LBS_2 are all zero.~~

~~The costs of the external SO Settlement Day variables are as follows:~~

~~IncpayEXT = £129,966~~
~~BSCCA = £150,000~~
~~ET = £0~~
~~OM = £0~~

$$BSUoSEXT_{12} = £12{,}500 + £2{,}083$$
$$+ \left[(£129{,}966 + £150{,}000 + £0 - £0 + £0 + £0 + £0 + £0)/\ 48 \right]$$
$$= £12{,}500 + £2{,}083 + £5{,}833$$
$$= £20{,}416$$

~~Annual internal SO costs assumed for this example have been listed in table BS2 above.~~

~~$RPIF_1 = 1$~~

$$BSUoSINT_{12} = \left[(75{,}873{,}280 + 18{,}250{,}000 + 0 + 0 + 18{,}250{,}000) / 365 \right] * 1/48$$
$$= £6{,}414$$

~~Calculating the Total Balancing Services Use of System (BSUoS) charge for a Settlement Period j~~

~~The final step is to calculate the Total Balancing Services Use of System ($BSUoSTOT_{12}$) for Settlement Period 1 on Settlement Day 2.~~

$$BSUoSTOT_{12} = BSUoSEXT_{12} + BSUoSINT_{12}$$
$$= £20,416 + £6414$$
$$= £26,830$$

~~Day 365~~

~~If we now move to the end of the year, then once again the first step is to calculate the Daily Incentivised Balancing Cost for the final day (IBC_{365}) using the formula below:~~

~~Calculation of the Daily External SO Incentive Scheme Payment~~

$$IBC_{365} = CSOBM_{365} + BSCCA_{365} + BSCCV_{365} - OM_{365} - RT_{365}$$

$$= £700{,}000 + £200{,}000 + £150{,}000 + £200{,}000 - £0 - £0$$

$$= £1{,}050{,}000$$

~~Assuming that $CSOBM_{365}$ = £700,000~~
~~$BSCCA_{365}$ = £200,000~~
~~$BSCCV_{365}$ = £150,000~~
~~OM_{365} = £0~~
~~RT_{365} = £0~~

~~With $\sum_{364} IBC_d$ assumed to be £432,000,000 for the previous 364 days, it is possible to calculate Forecast Balancing Services Cost (FBC_{365}) from the outturn to date as follows:~~

$$FBC_{365} = \frac{\sum_{k=1}^{d=365} IBC_k}{\sum_{k=1}^{d=365} PFT_k} * NDS$$

$$= \frac{£432{,}000{,}000 + £1{,}050{,}000}{365} * 365$$

$$= £433{,}050{,}000$$

~~The values of SF_t, M_t and CB_t can now be read off table BS1. As FBC_{365} is £433,050,000, SF_t is now 0.25, M_t is £500,000,000 and CB_t is 0. Therefore $FYIncpayEXT_{365}$ is calculated as follows:~~

$$FYIncpayEXT_{365} = SF_t * (M_t - FBC_{365}) + CB_t$$

~~$= 0.25 * (£500{,}000{,}000 - £433{,}050{,}000) + £0$~~

$$= £16{,}737{,}500$$

~~The external SO incentive payment for the entire duration of the incentive scheme (FYIncpayEXT) is then used to calculate the total incentive payment to date (FKIncpayEXT), shown as follows:~~

$$FKIncpayEXT_{365} = \frac{FYIncpayEXT_{365}}{NDS} * \sum_{k=1}^{d=365} PFT_k$$

$$= \frac{£16{,}737{,}500}{365} * 365$$

$$= £16{,}737{,}500$$

Where:

NDS = Number of days in the incentive scheme

In this case the incentive payment is positive (£16,737,500) i.e. a payment to The Company. As this is the last day of the scheme this represents the overall incentive payment due to The Company i.e. with reference to the graph with Table BS1 25% of the difference between £500,000,000 and £433,050,000.

Again, the final step is to calculate today's external incentive payment (IncpayEXT$_{365}$ for day 365), shown as follows:

It has been assumed that the total incentive payments for the previous 364 days ($\sum_{k=0}^{d-1=364} IncpayEXT_k$) is £16,461,800.

$$IncpayEXT_{365} = FKIncpayEXT_{365} - \sum_{k=0}^{d-1=364} IncpayEXT_k$$
$$= £16{,}737{,}500 - £16{,}461{,}800$$
$$= £275{,}700$$

The costs of the external SO Settlement Period variables are as follows:

CSOBM = £14,583
BSCCV = £3,125

FIIR$_{365}$, BSC$_{365}$, SOTOC$_{365}$, and LBS$_{365}$ are all zero.

The costs of the external SO Settlement Day variables are as follows:

IncpayEXT = £275,700
BSCCA = £200,000
ET = £0
OM = £0

$$BSUoSEXT_{365} = £14{,}583 + £3{,}125$$
$$+ (£275{,}700 + £200{,}000 + £0 - £0 + £0 + £0 + £0 + £0)/48$$
$$= £14{,}583 + £3{,}125 + £9{,}910$$
$$= £27{,}618$$

Annual internal SO costs assumed for this example have been listed in Table BS2 above.

RPIF$_t$ = 1

$$BSUoSINT_{1,365} = \left[(£75{,}873{,}280 + £18{,}250{,}000 + 0 + 0 + £18{,}250{,}000)/365\right] * 1/48$$
$$= £6{,}414$$

~~Calculating the Total Balancing Services Use of System (BSUoS) charge for a Settlement Period j~~

~~The final step is to calculate the Total Balancing Services Use of System ($BSUoSTOT_{1365}$) for Settlement Period 1 on Settlement Day 365~~

$$BSUoSTOT_{1,365} = BSUoSEXT_{1,365} + BSUoSINT_{1,365}$$
$$= £27{,}618 + £6{,}414$$
$$= £34{,}032$$