

REQUIREMENTS SPECIFICATION for Modification Proposal P211 'Main Imbalance Price Based on Ex-Post Unconstrained Schedule'

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Proposed Modification P211 seeks to amend the calculation of the "main" imbalance price such that when the market is short ($NIV > 0$), System Buy Price (SBP) will be based on the least expensive Offers that the System Operator (SO) could have utilised on an unconstrained system. Conversely, when the market is long ($NIV < 0$), System Sell Price (SSP) will be based on the least expensive Bids that the SO could have utilised on an unconstrained system. PAR Tagging would then be applied to the new price stack to ensure that only the most expensive 500 MWh of Bids or Offers are used to set the main price. The 'reverse' price would remain unchanged.

BACKGROUND AND PURPOSE OF IMPACT ASSESSMENT

The BSC Panel considered P211 at its meeting on 10 May 2007 and submitted the proposal to a 4-month Assessment Procedure to be conducted by the P211 Modification Group (formed from members of the Pricing Standing Modification Group. The P211 Modification Group ('the Group') has met four times to date on 15, 22 May and 6 and 13 June 2007 and agreed the requirements for the Proposed Modification. This document sets out the requirements agreed by the Group, and supports impact assessment by BSC Agents, BSC Parties, the Transmission Company and BSCCo.¹

Any queries regarding the impact assessment requirements should be addressed to Chris Stewart (020 7380 4309), e-mail address chris.stewart@elexon.co.uk.

¹ The Balancing and Settlement Code Company (ELEXON).

CONTENTS TABLE

| | |
|---|-----------|
| Summary of Impacted Parties and Documents | 3 |
| 1 Summary of Proposed Modification Solution | 4 |
| 1.1 The Existing Arrangements | 4 |
| 1.2 P211 Arrangements | 5 |
| 2 Detail of Proposed Modification Solution Requirements | 8 |
| 2.1 Defining time weighted average variables..... | 8 |
| 2.2 Calculating DAOV and DABV..... | 9 |
| 2.3 EPUS Arbitrage tagging..... | 10 |
| 2.4 Forming the EPUS | 11 |
| 2.5 Determination of System Length..... | 12 |
| 2.6 EPUS NIV Tagging..... | 12 |
| 2.7 EPUS PAR Tagging | 13 |
| 2.8 Main Energy Imbalance Price Calculation | 14 |
| 3 Estimated Impact of Modification on Systems, Processes and Documentation . | 15 |
| 4 Development Process | 18 |
| 5 Terms Used in this Document | 18 |
| 6 Document Control..... | 18 |
| 6.1 Authorities..... | 18 |

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SUMMARY OF IMPACTED PARTIES AND DOCUMENTS

As far as the Modification Group has been able to assess, the following parties/documents would be impacted by P211.

Please note that this table represents a summary of the full initial impact assessment contained in Section 3.

| Parties | Sections of the BSC | Code Subsidiary Documents |
|---|---------------------------------------|--|
| Distribution System Operators <input type="checkbox"/> | A <input type="checkbox"/> | BSC Procedures <input checked="" type="checkbox"/> |
| Generators <input checked="" type="checkbox"/> | B <input type="checkbox"/> | Codes of Practice <input type="checkbox"/> |
| Interconnectors <input checked="" type="checkbox"/> | C <input type="checkbox"/> | BSC Service Descriptions <input checked="" type="checkbox"/> |
| Licence Exemptable Generators <input checked="" type="checkbox"/> | D <input type="checkbox"/> | Party Service Lines <input type="checkbox"/> |
| Non-Physical Traders <input checked="" type="checkbox"/> | E <input type="checkbox"/> | Data Catalogues <input checked="" type="checkbox"/> |
| Suppliers <input checked="" type="checkbox"/> | F <input type="checkbox"/> | Communication Requirements Documents <input type="checkbox"/> |
| Transmission Company <input checked="" type="checkbox"/> | G <input type="checkbox"/> | Reporting Catalogue <input checked="" type="checkbox"/> |
| Party Agents | | |
| Data Aggregators <input type="checkbox"/> | H <input type="checkbox"/> | Core Industry Documents |
| Data Collectors <input type="checkbox"/> | I <input type="checkbox"/> | Ancillary Services Agreement <input type="checkbox"/> |
| Meter Administrators <input type="checkbox"/> | J <input type="checkbox"/> | System Operator – Transmission Owner Code <input type="checkbox"/> |
| Meter Operator Agents <input type="checkbox"/> | K <input type="checkbox"/> | Data Transfer Services Agreement <input type="checkbox"/> |
| ECVNA <input type="checkbox"/> | L <input type="checkbox"/> | Distribution Code <input type="checkbox"/> |
| MVRNA <input type="checkbox"/> | M <input type="checkbox"/> | Distribution Connection and Use of System Agreement <input type="checkbox"/> |
| BSC Agents | | |
| SAA <input checked="" type="checkbox"/> | N <input type="checkbox"/> | Grid Code <input type="checkbox"/> |
| FAA <input type="checkbox"/> | O <input type="checkbox"/> | Master Registration Agreement <input type="checkbox"/> |
| BMRA <input checked="" type="checkbox"/> | P <input type="checkbox"/> | Supplemental Agreements <input type="checkbox"/> |
| ECVAA <input type="checkbox"/> | Q <input checked="" type="checkbox"/> | Use of Interconnector Agreement <input type="checkbox"/> |
| CDCA <input type="checkbox"/> | R <input type="checkbox"/> | BSCCo |
| TAA <input type="checkbox"/> | S <input type="checkbox"/> | Internal Working Procedures <input checked="" type="checkbox"/> |
| CRA <input type="checkbox"/> | T <input checked="" type="checkbox"/> | BSC Panel/Panel Committees |
| SVAA <input type="checkbox"/> | U <input type="checkbox"/> | Working Practices <input type="checkbox"/> |
| Teleswitch Agent <input type="checkbox"/> | V <input checked="" type="checkbox"/> | Other |
| BSC Auditor <input type="checkbox"/> | W <input type="checkbox"/> | Market Index Data Provider <input type="checkbox"/> |
| Profile Administrator <input type="checkbox"/> | X <input checked="" type="checkbox"/> | Market Index Definition Statement <input type="checkbox"/> |
| Certification Agent <input type="checkbox"/> | | System Operator-Transmission Owner Code <input type="checkbox"/> |
| Other Agents | | |
| Supplier Meter Registration Agent <input type="checkbox"/> | | Transmission Licence <input type="checkbox"/> |
| Unmetered Supplies Operator <input type="checkbox"/> | | |
| Data Transfer Service Provider <input type="checkbox"/> | | |

1 SUMMARY OF PROPOSED MODIFICATION SOLUTION

1.1 The Existing Arrangements

Under the current baseline, actions taken by the SO to balance Supply and Demand for a Settlement Period set the main Energy Imbalance Prices (System Buy Price (SBP) when the system is 'short' and System Sell Price (SSP) when the system is 'long').

The current methodology for determining system length (whether the system is 'long' or 'short') was introduced under Approved Modification P78 'Revised Definitions of System Buy Price and System Sell Price'. Overall system imbalance (i.e. Net Imbalance Volume or 'NIV') is currently determined by summing the Pre-Gate Closure trades (reflected in Balancing Services Adjustment Data or 'BSAD') with the Bids and Offers accepted by the SO. The system is 'long' when Bids and / or Relevant Balancing Services predominate and the system is 'short' when Offers and / or Relevant Balancing Services predominate.

The following information contributes to the calculation of the main Energy Imbalance Price:

- Actions taken within the Balancing Mechanism to increase the total energy on the system (Accepted Offers), or actions within the Balancing Mechanism to decrease the total energy on the system (Accepted Bids); and
- Relevant Balancing Services provided outside the Balancing Mechanism, represented via BSAD.

When the system is estimated by the method above to be short of energy, the main price (i.e. SBP as the price applied to imbalances in the same direction as the system) is based on the volume weighted average of the most expensive 500MWh² of priced balancing actions (accepted Offers and BSAD) remaining, following the application of the following rules:

- **De Minimis:** Individual accepted Bid and Offer Volumes below a defined threshold (1 MWh) are excluded from the price calculation completely. This approach is intended to remove 'false' actions created due to the finite accuracy of the systems used to calculate Bid and Offer Volumes;
- **Arbitrage:** Accepted Bids and Offers where no net energy has been delivered to the system but which have provided an overall financial benefit to the system are excluded from the price calculation completely (i.e. where the price of an accepted Offer Volume is less than the price of an accepted Bid Volume);
- **CADL:** Acceptance Volumes associated with Acceptances of short duration (below the Continuous Acceptance Duration Limit (CADL) currently 15 minutes) are treated as un-priced³ in the price calculation;
- **BSAD:** NGET determines whether Relevant Balancing Services will be treated as priced or un-priced. BSAD is calculated net⁴ and represents both priced and un-priced Relevant Balancing Services in aggregate form;
- **Emergency Instructions:** On the determination of NGET, Accepted Bids and Offers associated with Emergency Instructions may be tagged as Excluded Emergency

² This is known as the Price Average Reference (PAR) volume. PAR is currently 500MWh. When the system has excess energy (said to be 'long') then the main price (SSP) will be based on the volume weighted average of the most expensive 500MWh of priced balancing actions (accepted Bids and Energy BSAD) remaining following the application of the tagging mechanism rules. If the NIV is less than 500 MWh then no volumes will be PAR tagged.

³ Un-priced volumes contribute to the determination of which actions set the main Energy Imbalance Price, however the costs of these actions are not included in the main Energy Imbalance Price.

⁴ This means that in any Settlement Period there can only be one non-zero volume of Energy BSAD (EBVA or ESVA), and one non-zero volume of System BSAD (either SBVA or SSVVA).

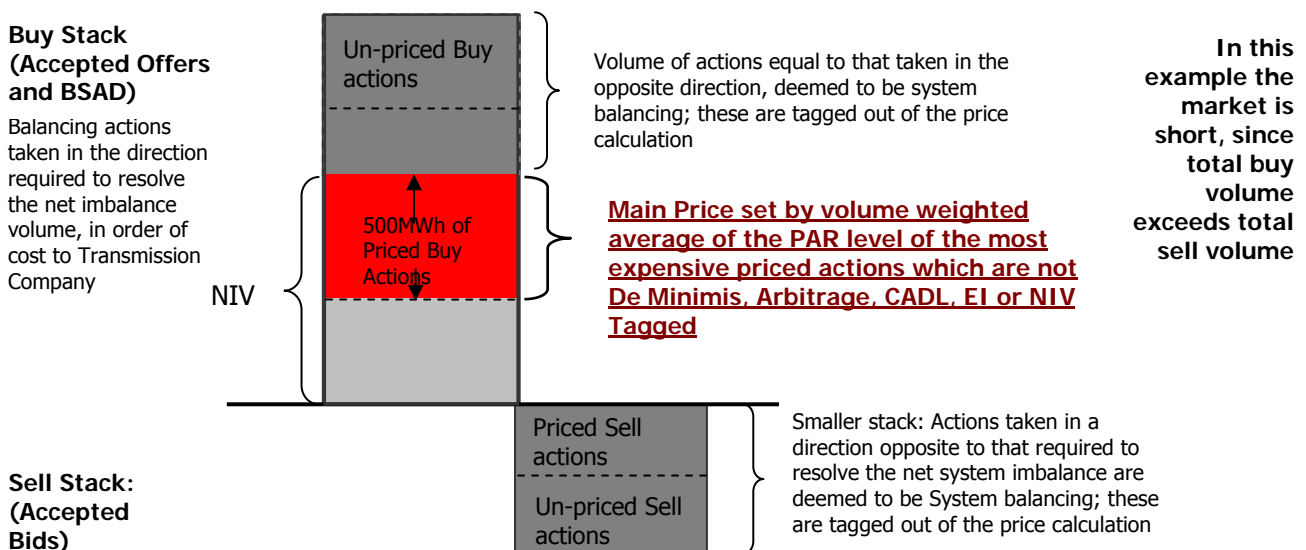
Acceptances and therefore treated as un-priced for the purpose of Energy Imbalance Price Calculation;

- **NIV Tagging:** Following application of the rules outlined previously, the Net Imbalance Volume (NIV) tagging process is applied to determine which of the priced actions will be subject to PAR tagging; and
- **PAR Tagging:** Following application of the rules outlined previously, the Price Average Reference (PAR) tagging process is applied to determine which of the priced actions will contribute to the calculation of Energy Imbalance Prices

These processes are collectively known as the 'tagging mechanism'. The de-minimis, CADL, emergency instructions and NIV Tagging functions are the processes to remove what are deemed to be system balancing actions from the main price.

In addition, trades undertaken on power exchanges feed into market prices provided by Market Index Data Providers (or a single provider, as it currently stands). The reverse Energy Imbalance Price (i.e. the price applied to imbalances in the opposite direction to the system) is based on the market price derived from data submitted by Market Index Data Providers.

Figure 1. Example of the Existing Arrangements Main Imbalance Price Calculation (Short System)



1.2 P211 Arrangements

Under P211, the mechanism for calculating Energy Imbalance prices compares to the current baseline as follows:

- Rather than using actions taken within the Balancing Mechanism to increase the total energy on the system (Accepted Offers), or actions within the Balancing Mechanism to decrease the total energy on the system (Accepted Bids), the information that contributes to the calculation of the main Energy Imbalance Price in each Settlement Period will be Deemed Available Offer Volumes (DAOV) and Deemed Available Bid Volumes (DABV) for each price band for each BM Unit which submits bid-offer volumes;
- DABV and DAOV values in each period will be determined from the time weighted average Final Physical Notification (FPN) and the levels of submitted bid-offer bands capped by time weighted

average Maximum Import Limit (MIL) and time weighted average Maximum Export Limit (MEL) where relevant;

- The MIL and MEL used will be the latest available at the end of the relevant Settlement Period. In the event of system issues prevent the end of settlement period view of MIL/MEL profiles being promptly provided and loaded by SAA/BMRA, later runs should use the late arriving MIL/MEL data when access to this data becomes available;
- For each BMU:
 - The total time weighted average DABV cannot exceed the difference between the time weighted average MIL less the time weighted average FPN;
 - The total time weighted average DAOV cannot exceed the difference between the time weighted average MEL less the time weighted average FPN; and
 - Any volumes between time weighted average MEL and time weighted average FPN plus the sum of all positive numbered offer volume intervals for that BMU or between time weighted average MIL and time weighted average FPN less the sum of all negatively numbered bid volume intervals for that BMU shall be deemed to be 'unpriced' and will not enter the EPUS stack.
- The determination of Relevant Balancing Services provided outside the Balancing Mechanism, represented via BSAD will not change;
- The existing process for determining whether SSP or SBP is the main Energy Imbalance Price (the existing NIV process) will not change.
- The existing process for determining the MWh size of the NIV (using accepted bids, offers and BSAD) will not change. However, as the prices of actual acceptances making up NIV would not be used for the Main Imbalance Price calculation it should be noted that the existing process can be simplified as described in 2.5 below.
- A new stack will be built from collating the available Bids (DABV) and Offers (DAOV) plus Energy BSAD⁵. This stack will form the Ex-Post Unconstrained Schedule (EPUS);
- De Minimis and Emergency Instruction tagging will not apply to the EPUS stack;
- EPUS⁶ Arbitrage tagging will apply to the EPUS stack to remove any DAOV that are priced less than or equal to DABV;
- EPUS NIV tagging will be applied to the EPUS stack (after the EPUS Arbitrage tagging) to exclude the DABV, DAOV and BSAD that will not be required for determining the main Energy Imbalance Price such that:
 - When NIV is positive, starting from the least expensive, only priced buy volumes up to the volume of NIV are included; and
 - When NIV is negative, starting from the least expensive, only priced sell volumes up to the volume of NIV are included.
- PAR tagging will be applied such that a volume weighted average of the PAR volume portion of the most expensive⁷ priced un-(EPUS)-tagged volumes will set the main price;

⁵ Energy BSAD excludes System Buy Price Volume Adjuster (SBVA) and System Sell Price Volume Adjuster (SSVA) which are not to be included in the EPUS stack.

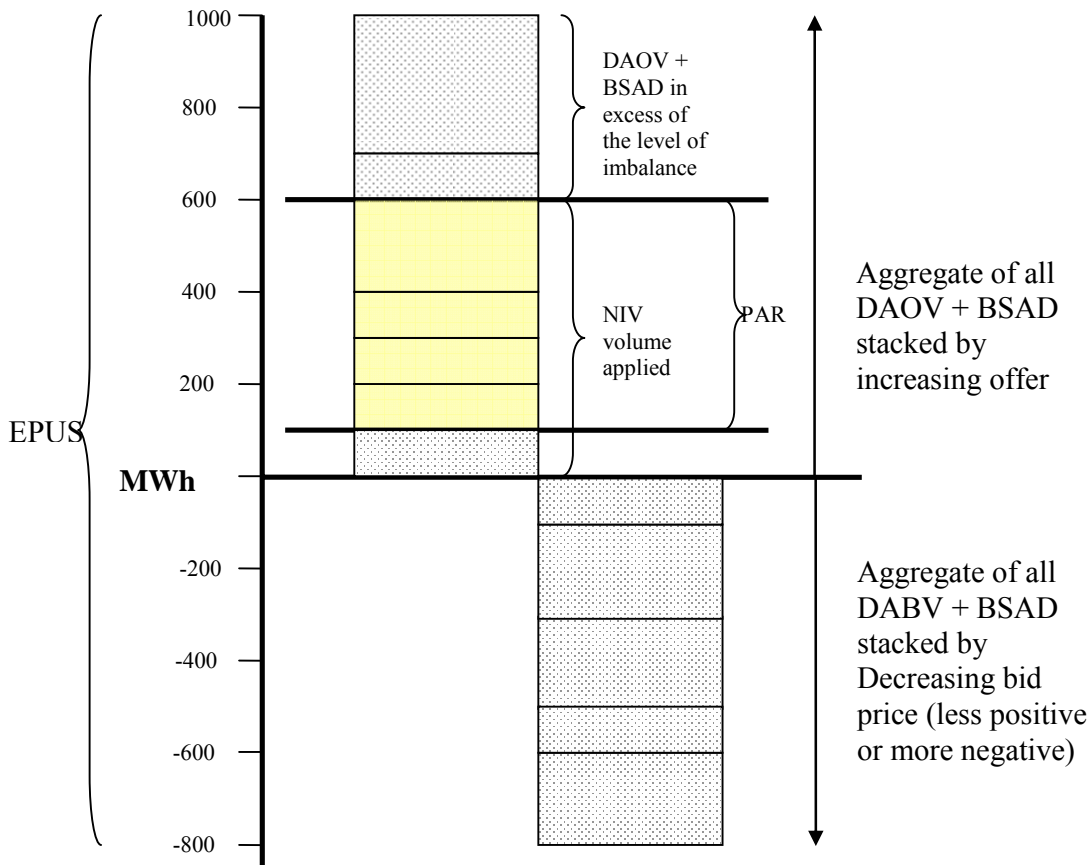
⁶ The terms 'EPUS Arbitrage tagging' and 'EPUS NIV tagging' are used here to differentiate from the tagging that occurs in the determination of the NIV.

⁷ It should be noted that 'least expensive' should, in this context, be considered in relation to the benefit of the System. Offers are bought by the System for an increase in energy, thus the 'least expensive' will be the Offer that cost the least to take. Since Bids are

- The PAR volume will not change from the existing value of 500MWh; and
- The method for calculating the reverse price will not change.
- With regard to Manifest Errors, for the purposes of the EPUS, only the original price submitted for Bid-Offer Pairs should be used.

paid to the System by Parties for a reduction in energy, the least expensive Bid will be the one that pays the system the most. A negative Bid price will be expensive to the System, as the System is paying (rather than being paid) to reduce energy. Similarly, when using the term 'most expensive', it should be considered in this context.

Figure 2. Example of the P211 Arrangements Main Imbalance Price Calculation when Short



2 DETAIL OF PROPOSED MODIFICATION SOLUTION REQUIREMENTS

2.1 Defining time weighted average variables

2.1.1 Current Bid-Offer Pairs

Bid-Offer pairs (BO_{ij}^n) consist of a MW band, Offer Price (PO_{ij}^n), Bid Price (PB_{ij}^n) (both in £/MWh), and an associated Bid-Offer pair number 'n'. There can be up to 5 Bid-Offer pairs with positive MW levels relative to FPN ($n = 1$ to 5) and up to 5 Bid Offer pairs with negative MW levels relative to FPN ($n = -1$ to -5).

For BMU i in Settlement Period j , positive numbered ($n > 0$) Bid-Offer Pairs are denoted by $n+$.

For BMU i in Settlement Period j , negative numbered ($n < 0$) Bid-Offer Pairs are denoted by $n-$.

2.1.2 Time-weighting FPN, MEL, MIL and Bid-Offer Pairs

Generators, Suppliers and large customers can provide Bid-Offer pairs to NGET. These are made up of volumes obtained from the difference between a Balancing Mechanism Unit's (BMU's) Final Physical Notification⁸ (FPN) and its Maximum Export Limit (MEL) for Offers, and its Maximum Import Limit (MIL) for Bids.

FPN, MEL, MIL and Bid-Offer pairs are made up of a set of spot values either within a Settlement Period or spanning more than one Settlement Period. Up to two 'point' variables can be submitted for a single spot time. (i.e. the "to" and "from" time).

⁸ The Final Physical Notification is the level of generation or demand that the Registrant of the BMU expects to generate or consume. This is submitted to NGC prior to Gate Closure as a series of MWh values with corresponding to and from times.

For the purposes of P211 FPN and Bid Offer pairs used will be those available at gate closure. For MEL and MIL, the profile to be used will be the latest available at the end of the Settlement Period.

As these point variables must be submitted in a whole number of minutes, there are 31 spot times⁹ for which point data may be submitted for any Settlement Period.

Interpolation will be used to obtain a value at every instant in the Settlement Period. Integration is then used to give a MWh value for FPN, MEL, MIL and Bid-Offer volume.

These time weighted average variables for each BMU i in Settlement Period j shall be known as Period FPN (FPN_{ij})¹⁰, Period MEL (MEL_{ij}), and Period MIL (MIL_{ij}). Period Bid-Offer volume (QBO_{ij}^n) will also be identified by the Bid-Offer Pair number, n .

The Period Bid-Offer Volume QBO_{ij}^n should be derived by integrating the Bid-Offer Volume $qBO_{ij}^n(t)$.

Period MEL and MIL values MEL_{ij} and MIL_{ij} should be derived in the same way as FPN_{ij} i.e. define values $MEL_{ij}(t)$ and $MIL_{ij}(t)$ for each spot time t in the Settlement Period, and then integrate.

2.2 Calculating DAOV and DABV

DAOV, in addition to any net Energy BSAD Buy actions, will form the basis for the 'Buy' side of the EPUS stack. Similarly DABV, in addition to any net Energy BSAD Sell actions, will form the basis for the 'Sell' side of the EPUS stack.

DAOV will be determined as being the volume of the positive time weighted average Bid-Offer pairs that lie between the time weighted average FPN and time weighted average MEL for every BMU. The sum of all positive time weighted average Bid-Offer Pairs cannot exceed the difference between time weighted average FPN and time weighted average MEL at each BMU. Similarly, the DABV will be determined by the sum of the negative time weighted average Bid-Offer pairs that lie between the time weighted average FPN and time weighted average MIL for every BMU. The sum of all negative numbered time weighted average Bid-Offer Pairs cannot exceed the difference between time weighted average FPN and time weighted average MIL at each BMU.

No dynamic parameters would be considered when deriving DAOV and DABV.

Any volume that exists for a BMU between the time weighted average top priced Offer $PO_{ij}^{n+\max}$ and time weighted average MEL (MEL_{ij}) that is not priced is excluded from being a DAOV. Similarly, any volume that exists for a BMU between the time weighted average top priced Bid $PB_{ij}^{n-\min}$ and time weighted average MIL (MIL_{ij}) that is not priced is excluded from being a DABV.

This is represented by the following equations and can be seen graphically in Figure 3 below:

For each Settlement Period, for each BM Unit, for each Submitted Bid-Offer Pair for which the associated Bid-Offer Pair Number n is greater than zero, the Deemed Available Offer Volume ($DAOV_{ij}^n$) shall be:

a) For $n = 1$:

$$DAOV_{ij}^n = \min \{ BO_{ij}^n, \max (MEL_{ij} - FPN_{ij}, 0) \}$$

b) For $n > 1$:

$$DAOV_{ij}^n = \min \{ QBO_{ij}^n, \max (MEL_{ij} - FPN_{ij} - \sum^{n'} DAOV_{ij}^{n'}, 0) \}$$

⁹ The 31 spot points allow for the points at the start and the end of the Settlement Period. i.e. minute zero through to minute 30.

¹⁰ This is already defined and calculated in the BSC under T3.2 which covers linear interpolation of the submitted FPN data to create a value $FPN_{ij}(t)$ for each spot time t in the Settlement Period. T4.3.1 covers the integration of $FPN_{ij}(t)$ to produce a MWh value FPN_{ij} for the Settlement Period.

where $\sum^{n'}$ represents the sum over the range of positive Bid-Offer Pair Numbers n' from 1 to $(n-1)$ of Submitted Bid-Offer Pairs.

For each Settlement Period, for each BM Unit, for each Submitted Bid-Offer Pair for which the associated Bid-Offer Pair Number n is less than zero, the Deemed Available Bid Volume ($DABV_{ij}^n$) shall be:

a) For $n = -1$:

$$DABV_{ij}^n = \max \{ QBO_{ij}^n, \min (MIL_{ij} - FPN_{ij}, 0) \}$$

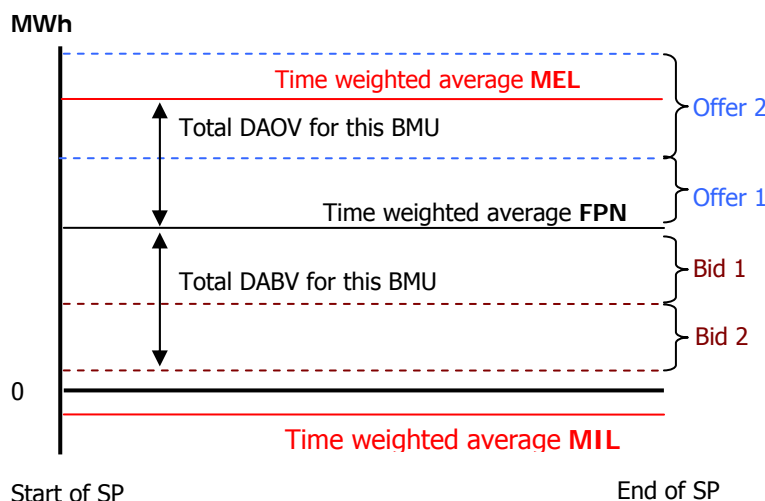
b) For $n < -1$:

$$DABV_{ij}^n = \max \{ QBO_{ij}^n, \min (MIL_{ij} - FPN_{ij} - \sum^{n'} DABV_{ij}^{n'}, 0) \}$$

where $\sum^{n'}$ represents the sum over the range of negative Bid-Offer Pair Numbers n' from -1 to $(n+1)$ of Submitted Bid-Offer Pairs.

In drafting this Requirement Specification, concern has been expressed that it may be inefficient to require BMRA and SAA to calculate MIL_{ij} , MEL_{ij} , $DAOV_{ij}$ and $DABV_{ij}$ for all BM Units, when many of these values will then be EPUS NIV Tagged (and hence have no impact on Energy Imbalance Prices). This could be a particular concern in the context of BMRS, where prompt price reporting is of the essence. If this were a genuine issue, it could be addressed by only requiring the BMRA and SAA to build enough of the DAOV/DABV stack to calculate Energy Imbalance Prices (i.e. allow them to start building the stack with the cheapest Bids and Offers, and to stop when a sufficient volume of stack has been constructed in order to complete EPUS Arbitrage tagging and then ensure that all remaining DAOV and DABV volumes would be NIV tagged). As part of this impact assessment, views are sought from service providers on whether this approach would be advantageous. Views are also sought from Parties on whether it would be acceptable (given that it would prevent the reporting of MIL_{ij} , MEL_{ij} , $DAOV_{ij}$ and $DABV_{ij}$ for those Bids and Offers that were wholly EPUS NIV Tagged).

Figure 3. DAOV and DABV



2.3 EPUS Arbitrage tagging

In respect of each Settlement Period, Arbitrage DAOV and Arbitrage DABV shall be removed so that these do not enter the EPUS stack. This process for EPUS Arbitrage tagging is the same as the current process for

Arbitrage tagging except it is applied to the DABV and DAOV volumes instead of accepted bid and offer volumes.

Arbitrage Bids are those negative numbered¹¹ Bids (n-) (or parts thereof) capped where appropriate by MIL in Settlement Period j, for which the Bid Price is greater than or equal to the Offer Price of one or more positively numbered Offer in the same Settlement Period. The quantity of Arbitrage Bids tagged as such in a particular Settlement Period is limited by the aggregate quantity of positively numbered Offers for which the Offer Price is less than or equal to the Bid Price.

Similarly, Arbitrage Offers are those positively numbered Offers (n+) (or parts thereof) capped where appropriate by MEL in Settlement Period j, for which the Offer Price is less than or equal to the Bid Price of one or more negatively numbered Bid in the same Settlement Period. The quantity of Arbitrage Offers tagged as such in a particular Settlement Period is limited by the aggregate quantity of negatively numbered Bids for which the Bid Price is greater than or equal to the Offer Price.

2.4 Forming the EPUS

P211 builds an EPUS stack for every Settlement Period based on:

- All of the Non-EPUS Arbitrage Tagged DABV and DAOV ranked in price order, cheapest first.
- Including Energy BSAD, as it is currently determined, in the EPUS in price order.

2.4.1 Determining EPUS Ranked Bid Volumes

The set of all Period Bids that are neither EPUS Arbitrage Bids or capped by Period MIL (PMIL) will be ranked in price order, most expensive first (where the most expensive is allocated an n^{\wedge} value of 1, the next most expensive a value of 2 and so on). If any Period Bids have the same price then the ordering of such Period Bids will be random. The set of non-arbitrage Period Bids (that have been capped where appropriate by PMIL) is then a set of '**EPUS Ranked Priced Bids**'.

The Sell Price Volume Adjustment (Energy) (ESVA_j) will be added into the set of EPUS Ranked Priced Bids according to the Sell Price Cost Adjustment (Energy) (ESCA_j) (converted to a price in £/MWh, i.e. ESCA_j / ESVA_j). The volume will be assigned a n^{\wedge} value and the n^{\wedge} values of the EPUS Ranked Priced Bids will be adjusted accordingly. The set of EPUS Ranked Priced Bids including the ESVA_j will then be a set of '**EPUS Ranked Bids**'.

Where the price of the ESVA_j is the same as any other EPUS Ranked Priced Bid, then the ESVA_j will be given the higher n^{\wedge} value with the same price.

This will then constitute a set of '**EPUS Ranked Bid Volumes**' as follows:

$$(DABV^{n^{\wedge}}_{ij\dots})(ESVA^{n^{\wedge}}_j)$$

2.4.2 Determining EPUS Ranked Offer Volumes

The set of all Period Offers that are neither EPUS Arbitrage Bids or capped by Period MEL (PMEL) will be ranked in price order, most cheapest first (where the cheapest is allocated an n^{\sim} value of 1, the next cheapest a value of 2 and so on). If any Period Offers have the same price then the ordering of such Period Offers will be random. The set of non-arbitrage Period Offers (that have been capped where appropriate by PMEL) is then a set of '**EPUS Ranked Priced Offers**'.

The Buy Price Volume Adjustment (Energy) (EBVA_j) will be added into the set of EPUS Ranked Priced Offers according to the Buy Price Cost Adjustment (Energy) (EBCA_j) (converted to a price in £/MWh, i.e. EBVA_j / EBVA_j). The volume will be assigned a n^{\sim} value and the n^{\sim} values of the EPUS Ranked Priced Offers will be

¹¹ Positively numbered and negatively numbered here refers to the Bid-Offer Pair number, n.

adjusted accordingly. The set of EPUS Ranked Priced Offers including the $EBVA_j$ will then be a set of 'EPUS Ranked Offers'.

Where the price of the $EBVA_j$ is the same as any other EPUS Ranked Priced Offer, then the $EBVA_j$ will be given the higher n^{\sim} value with the same price.

This will then constitute a set of 'EPUS Ranked Offer Volumes' as follows:

$$(DAOV^{n^{\sim}}_{ij\dots})(EBVA^{n^{\sim}}_j)$$

2.5 Determination of System Length

Whilst NIV will remain as the method for determining the direction and MWh value of system imbalance, it is not used for the Main Imbalance Price calculation. Thus it is not necessary for the Bid and Offer Acceptances and BSAD used in the NIV calculation to be ranked in price order. Specifically:

- NIV tagging of Bid–Offer Acceptances is not required as this removes equal volumes from both the buy and sell stacks, and therefore has no impact on the NIV calculation.
- Tagging CADL and Emergency Instructions will not need to occur as this has no impact on the NIV calculation; and
- Arbitrage tagging will not be required as this does not impact the direction or the size of the NIV.

It has not been determined whether De Minimis will be retained in the final solution. Therefore, as part of this impact assessment, costs are sought from service providers to both include and exclude De Minimis.

Where De Minimis is included, the current NIV calculation can be simplified to:

$$NIV_j = (\sum_i \sum^n QAO^{n^{\sim}}_{ij} + EBVA_j + SBVA_j + \sum_i \sum^n QAB^{n^{\sim}}_{ij} + ESVA_j + SSVA_j)$$

where \sum_i is over all BM Units and \sum^n is over all Accepted Bids and Offers that are not De Minimis Accepted Bids or De Minimis Accepted Offers.

Where De Minimis is not included, the current NIV calculation can be simplified to:

$$NIV_j = (\sum_i \sum^n QAO^{n^{\sim}}_{ij} + EBVA_j + SBVA_j + \sum_i \sum^n QAB^{n^{\sim}}_{ij} + ESVA_j + SSVA_j)$$

where \sum_i is over all BM Units and \sum^n is over all Accepted Bids and Offers.

2.6 EPUS NIV Tagging

P211 will require EPUS NIV tagging to exclude DAOV and DABV and net Energy BSAD that will not contribute to the Energy Imbalance Price calculation. It should be noted that:

- **For the current process**, NIV is equal to the difference in length between the two (Buy and Sell) stacks, and the tagging process removes an equal volume from each stack; and
- **For the new process**, NIV is unrelated to the lengths of the two (EPUS Buy and EPUS Sell) stacks and the tagging process removes different volumes from each.

2.6.1 When NIV < 0

Where NIV is less than zero, only the EPUS Ranked Bid Volumes will be used and thus the EPUS Ranked Offer Volumes are tagged out and will be defined as EPUS NIV tagged.

The EPUS Ranked Bid Volume that will be EPUS NIV tagged is that for which the sum of EPUS Ranked Bid Volumes is less than NIV^{12} . This can be described as follows:

When $\sum^{n^{\wedge}}(DABV^{n^{\wedge}}_{ij} + ESVA^{n^{\wedge}}_j) \leq NIV$, there must be a number x and a number p (which may be a fraction or zero) for which

$$NIV = \sum^{n^{\wedge} < x}(DABV^{n^{\wedge}}_{ij} + ESVA^{n^{\wedge}}_j) + p * \sum^{n^{\wedge} x}(DABV^{n^{\wedge}}_{ij} + ESVA^{n^{\wedge}}_j)$$

Each EPUS Ranked Bid numbered $x+1$ or higher can then be defined as EPUS NIV tagged. The EPUS Ranked Bid numbered x will be known as the threshold DABV or ESVA and will be subject to:

The fraction $1 - p$ of the threshold DABV or ESVA will also be defined as EPUS NIV tagged.

When $\sum^{n^{\wedge}}(DABV^{n^{\wedge}}_{ij} + ESVA^{n^{\wedge}}_j) > NIV$ then no DABV or ESVA will be defined as EPUS NIV tagged.

2.6.2 When $NIV > 0$

Where NIV is greater than zero, only the EPUS Ranked Offer Volumes will be used and thus the EPUS Ranked Bid Volumes are tagged out and will be defined as EPUS NIV tagged.

The EPUS Ranked Offer Volume that will be EPUS NIV tagged is that for which the sum of EPUS Ranked Offer Volumes is greater than NIV . This can be described as follows:

When $\sum^{n^{\sim}}(DAOV^{n^{\sim}}_{ij} + EBVA^{n^{\sim}}_j) \geq NIV$, there must be a number x and a number p (which may be a fraction or zero) for which

$$NIV = \sum^{n^{\sim} < x}(DAOV^{n^{\sim}}_{ij} + EBVA^{n^{\sim}}_j) + p * \sum^{n^{\sim} x}(DAOV^{n^{\sim}}_{ij} + EBVA^{n^{\sim}}_j)$$

Each EPUS Ranked Offer numbered $x+1$ or higher can then be defined as EPUS NIV tagged. The EPUS Ranked Offer numbered x will be known as the threshold DAOV or EBVA and will be subject to:

The fraction $1 - p$ of the threshold DAOV or EBVA will also be defined as EPUS NIV tagged.

When $\sum^{n^{\sim}}(DAOV^{n^{\sim}}_{ij} + EBVA^{n^{\sim}}_j) < NIV$ then no DAOV or EBVA will be defined as EPUS NIV tagged.

2.7 EPUS PAR Tagging

PAR Tagging will occur on all non EPUS NIV tagged volumes. Non EPUS NIV Tagged volumes will be denoted by n^{\checkmark} .

This methodology is based on the existing PAR Tagging methodology but uses the new variable defined under P211.

2.7.1 When $NIV < 0$

When $NIV < 0$, the set of all EPUS Ranked Bid Volumes that are not EPUS NIV Tagged Bids will be subject to PAR Tagging.

If $\sum^{n^{\checkmark}}(DABV^{n^{\checkmark}}_{ij} + ESVA^{n^{\checkmark}}_j) \geq (-PAR)$ then none of the EPUS Ranked Offer Volumes will be PAR Tagged.

If $\sum^{n^{\checkmark}}(DABV^{n^{\checkmark}}_{ij} + ESVA^{n^{\checkmark}}_j) < (-PAR)$ there must exist a number f and number Φ (which may be a fraction or one) for which

$$PAR = \sum^{n^{\checkmark} < f}(DABV^{n^{\checkmark}}_{ij} + ESVA^{n^{\checkmark}}_j) + \Phi * (DABV^{n^{\checkmark}}_{ij} + ESVA^{n^{\checkmark}}_j)$$

Where $\sum^{n^{\checkmark} < f}$ is the sum over those EPUS Ranked Bid Volumes that are not EPUS NIV Tagged Bid for which v is less than f .

¹² Here NIV is a negative number, $ESVA$ is a negative number and, as defined in 2.2, $DABV$ is also a negative number. Thus EPUS NIV tagging will only occur when $ESVA$ plus $DABV$ is a more negative number than NIV .

Each n numbered $f - 1$ or lower can then be defined as EPUS PAR tagged. The n numbered f will be known as the threshold DABV or ESVA and will be subject to:

The fraction $1 - \Phi$ of the threshold DAOV or EBVA will also be defined as EPUS PAR tagged.

2.7.2 When NIV > 0

When $NIV > 0$, the set of all EPUS Ranked Offer Volumes that are not EPUS NIV Tagged Offers will be subject to PAR Tagging.

If $\sum^n (DAOV_{ij}^n + EBVA_j^n) \leq PAR$ then none of the EPUS Ranked Offer Volumes will be PAR Tagged.

If $\sum^n (DAOV_{ij}^n + EBVA_j^n) > PAR$ there must exist a number f and number Φ (which may be a fraction or one) for which

$$PAR = \sum^{n^{v < f}} (DAOV_{ij}^v + EBVA_j^v) + \Phi * (DAOV_{ij}^f + EBVA_j^f)$$

Where $\sum^{n^{v < f}}$ is the sum over those EPUS Ranked Offer Volumes that are not EPUS NIV Tagged Offers for which v is less than f .

Each n numbered $f - 1$ or lower can then be defined as EPUS PAR tagged. The n numbered f will be known as the threshold DAOV or EBVA and will be subject to:

The fraction $1 - \Phi$ of the threshold DAOV or EBVA will also be defined as EPUS PAR tagged.

2.8 Main Energy Imbalance Price Calculation

Under P211, the main Energy Imbalance Price calculation will change such that when $NIV < 0$, the formula under 2.8.1 will set SSP. Similarly, the formula under 2.8.2 will set SBP when $NIV > 0$.

It has not been determined whether the Transmission Loss Multiplier (TLM_{ij}) will be retained in the final solution. Therefore, as part of this impact assessment, costs are sought from service providers to both include and exclude the Transmission Loss Multiplier in the main Energy Imbalance Price calculation.

2.8.1 When NIV < 0

When the system is long ($NIV < 0$), the main Energy Imbalance price will be calculated as the volume weighted average of the DABV and ESVA that has not been EPUS PAR Tagged¹³. The Sell Price Adjuster (SPA) will be applied as in the current arrangements.

When TLM is included and $NIV < 0$, then System Sell Price is the main price and will be determined as follows:

$$SSP_j = \{ \sum_i \sum^n (DABV_{ij}^n * PB_{ij}^n * TLM_{ij}) / \sum_i \sum^n (DABV_{ij}^n * TLM_{ij}) \} + SPA_j$$

Where \sum_i represents the sum over all BMU's and \sum^n represents the sum over all EPUS Ranked Bid Volumes that are not EPUS PAR Tagged Bids.

When TLM is not included and $NIV < 0$, then System Sell Price is the main price and will be determined as follows:

$$SSP_j = \{ \sum_i \sum^n (DABV_{ij}^n * PB_{ij}^n) / \sum_i \sum^n (DABV_{ij}^n) \} + SPA_j$$

Where \sum_i represents the sum over all BMUs and \sum^n represents the sum over all EPUS Ranked Bid Volumes that are not EPUS PAR Tagged Bids.

¹³ This is based on the fact that EPUS PAR tagged DABV and ESVA has already been subject to EPUS NIV tagging, EPUS Arbitrage tagging and capped where appropriate by PMIL.

2.8.2 When NIV > 0

When the system is short (NIV > 0), the main Energy Imbalance price will be calculated as the volume weighted average of the DAOV and EBVA that has not been EPUS PAR Tagged¹⁴. The Buy Price Adjuster (BPA) will be applied as in the current arrangements.

When TLM is included and NIV > 0, then System Buy Price is the main price and will be determined as follows:

$$SBP_j = \{ \sum_i \sum^n (DAOV_{ij}^n * PO_{ij}^n * TLM_{ij}) / \sum_i \sum^n (DAOV_{ij}^n * TLM_{ij}) \} + BPA_j$$

Where \sum_i represents the sum over all BMUs and \sum^n represents the sum over all EPUS Ranked Offer Volumes that are not EPUS PAR Tagged Offers.

When TLM is not included and NIV > 0, then System Buy Price is the main price and will be determined as follows:

$$SBP_j = \{ \sum_i \sum^n (DAOV_{ij}^n * PO_{ij}^n) / \sum_i \sum^n (DAOV_{ij}^n) \} + BPA_j$$

Where \sum_i represents the sum over all BMUs and \sum^n represents the sum over all EPUS Ranked Offer Volumes that are not EPUS PAR Tagged Offers.

3 TRANSMISSION COMPANY IMPLEMENTATION OPTION

In accordance with the Modification Group’s Terms of Reference to investigate alternative implementation options, the Transmission Company is also requested to provide an estimate of the development, capital and operating costs (broken down in reasonable detail) which the Transmission Company anticipates that it would incur in, and as a result of, implementing the Proposed Modification if the Transmission Company were also to produce:

- a) the EPUS stack (as defined in section 2.1-2.4 of the P211 Requirement Specification), after the application of EPUS Arbitrage Tagging, required to resolve NIV and provide this to BSC Central systems; or
- b) the main Energy Imbalance Price as derived in the P211 Requirement Specification (section 2) and provide this to BSC Central systems (BMRA) such as to enable prompt price reporting in the same (or similar) timescales as present..

4 ESTIMATED IMPACT OF MODIFICATION ON SYSTEMS, PROCESSES AND DOCUMENTATION

a) Impact on BSC Systems and Processes

| System / Process | Impact of Proposed/Alternative Modification |
|------------------|---|
| Settlement | The amendment of the Energy Imbalance Price calculation impacts the derivation of the Energy Imbalance Prices. The BMRA and SAA systems and processes will be impacted. |
| Reporting | It is envisaged that the revised Energy Imbalance Prices will be reported within the current interface structure. It will be necessary to amend the Settlement Report (SAA-I014) to reflect the new price derivation (including any new parameters). This will require additional reporting on the elements that make up the EPUS based |

¹⁴ This is based on the fact that EPUS PAR tagged DOBV and EBVA has already been subject to EPUS NIV tagging, EPUS Arbitrage tagging and capped where appropriate by PMEL.

| System / Process | Impact of Proposed/Alternative Modification |
|------------------|--|
| | <p>prices. Specifically for the SAA-I014:</p> <ul style="list-style-type: none"> • the DAOV, DABV, EBVA and/or ESVA per BM Unit and Bid-Offer number that resolves the NIV; • the DAOV, DABV, EBVA and/or ESVA per BM Unit and Bid-Offer number that have been PAR tagged; and • the DAOV and DABV per BM Unit and Bid-Offer number that have been EPUS Arbitrage tagged. <p>The additional costs for also providing this information on the BMRS also need to be identified.</p> |

b) Impact on BSC Agent Contractual Arrangements

| BSC Agent Contract | Impact of Proposed/Alternative Modification |
|--------------------|--|
| LogicaCMG | The SAA and BMRA System will be impacted. SAA reporting is affected. |

c) Impact on BSC Parties and Party Agents

As this Modification is a change to the Energy Imbalance Calculation, this is a significant change to one of the main tenets of the BSC Arrangements that will impact Settlement for all BSC Parties. Recipients of SAA reports (SAA-I013) will be affected by changes to the information provided. Additionally, Parties will be impacted by the change to sub-flow 1 of the Settlement Report (SAA-I014).

d) Impact on Transmission Company

The Transmission Company will need to ascertain if there is any impact on its ability to efficiently discharge its Transmission Licence obligations, and any impact on Security of Supply from the proposal due to any effect on incentives to balance. There may also be an impact on the computer systems and processes to accommodate the new DABV and DAOV quantities, changes to SAA reports (SAA-I014), and other BMU specific operational parameter information requirements of this Proposal. Additionally, the BMRA SAA Interface Specification will be impacted if NGET is required to send new data to the SAA/BMRA.

There would be additional impact if, as part of the solution, the Transmission Company is responsible for supplying the EPUS or prices derived under P210 to Central Systems.

e) Impact on BSCCo

| Area of Business | Impact of Proposed/Alternative Modification |
|------------------------------------|---|
| BSCCo Systems | <p>The Trading Operations Market Assurance System (TOMAS) would be impacted.</p> <p>Any change to the structure of SAA-I014 will impact ELEXON's Gatekeeper software.</p> |
| Other (e.g. costs, staffing, etc.) | <ul style="list-style-type: none"> • Industry Guidance notes may require revision to reflect changes to the approach to calculation of Energy Imbalance Prices. • The Change Implementation Team will be required to manage |

| Area of Business | Impact of Proposed/Alternative Modification |
|------------------|---|
| | <p>implementation of P211.</p> <ul style="list-style-type: none"> Corporate Assurance will be required to support the implementation project. The Design Authority team will provide Technical Assurance during the implementation project. |

f) Impact on Code

| Code Section | Impact of Proposed/Alternative Modification |
|--|--|
| Section Q 'Balancing Mechanism Activities' | Section Q may require amendment if there are changes to the BM data provided by NGET. |
| Section T 'Settlement and Trading Charges' | Section T would require amendment to detail the changes to the Energy Imbalance Price calculation. |
| Section V 'Reporting' | Section V would require amendment to detail the Reporting changes. |
| Annex X | Annex X would require amendment to introduce new, and remove any redundant, definitions. |

g) Impact on Code Subsidiary Documents

| Document | Impact of Proposed/Alternative Modification |
|---|--|
| SAA SD | The SAA Service Description will be impacted. |
| BMRA SD | The BMRA Service Description will be impacted. |
| BSCP01 'Overview of Trading Arrangements' | BSCP01 will need to be updated to reflect the new price calculation. |

h) Impact on Core Industry Documents/System Operator-Transmission Owner Code

| Document | Impact of Proposed/Alternative Modification |
|-----------|--|
| Grid Code | As operational parameters MIL and MEL will now also be used as a trading parameter to create the ex-post unconstrained schedule. |

i) Impact on Other Configurable Items

| Document | Impact of Proposed/Alternative Modification |
|---|--|
| SAA User Requirements Specification (and system documentation) | SAA documentation would require amendment to detail the amendments to the Energy Imbalance Price calculation. |
| BMRA User Requirements Specification (and system documentation) | BMRA documentation would require amendment to detail the amendments to the Energy Imbalance Price calculation. |
| BSC Business Process Model | The ELEXON BPM would require amendment to reflect the amendments to the Settlement calculations. |
| Interface Definition and Design | The IDD parts 1 and 2 will be impacted by the changes. |

j) Impact on BSCCo Memorandum and Articles of Association

No Impact

k) Impact on Governance and Regulatory Framework

No Impact

5 DEVELOPMENT PROCESS

For the purposes of the impact assessment, respondents should assume that P211 would be implemented as a stand-alone development project managed by BSCCo.

6 TERMS USED IN THIS DOCUMENT

Acronyms and defined terms take the meanings defined in Section X of the Code.

7 DOCUMENT CONTROL**7.1 Authorities**

| Version | Date | Author | Reviewer | Reason for Review |
|---------|----------|-------------------------|------------------------------|-------------------------------|
| 0.1 | 4/06/07 | Chris Stewart | Kevin Swinton/ John Lucas | For technical review |
| 0.2 | 06/06/07 | Chris Stewart | Modification Group | For Modification Group review |
| 1.0 | 13/06/07 | P211 Modification Group | | For impact assessment |