

09 May 2001

URGENT MODIFICATION REPORT

MODIFICATION PROPOSAL P10

Eliminating Imbalance Price Spikes Caused by Truncating Effects

Prepared by ELEXON on behalf of the Balancing and
Settlement Code Panel

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a Authorities

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0.1	09/05/01	Justin Andrews		Modification Group Chair

Version	Date	Approver	Signature	Responsibility

b Distribution

Name	Organisation
Ofgem	
BSC Panel	
Modification Group	
Parties and interested third parties	

c Intellectual Property Rights and Copyright

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1 INTRODUCTION

This Report has been prepared by ELEXON Ltd., on behalf of the Balancing and Settlement Code Panel ('the Panel'), in accordance with the terms of the Balancing and Settlement Code ('BSC'). The BSC is the legal document containing the rules of the balancing mechanism and imbalance settlement process and related governance provisions. ELEXON is the company that performs the role and functions of the BSCCo, as defined in the BSC.

This Modification Report is addressed and furnished to the Gas and Electricity Markets Authority ('the Authority') and none of the facts, opinions or statements contained herein may be relied upon by any other person.

An electronic copy of this document can be found on the BSC website, at www.elexon.co.uk

2 EXECUTIVE SUMMARY

On 2nd May 2001 the Transmission Company submitted Modification Proposal P10, proposing that the rules for calculating System Sell Price (SSP) and System Buy Price (SBP) laid out in Section T4.4 of the BSC should be amended to prevent 'spurious' Bid/Offer Acceptances from causing price spikes. Such spurious Acceptances arise because the acceptance data passed to settlement can only be specified to a finite level of accuracy¹.

The Transmission Company recommended that this Modification Proposal be treated as an Urgent Code Modification, in accordance with section F2.9 of the BSC. The Panel Chairman and the Authority agreed this recommendation, and a Modification Group met on 9^h May 2001 to discuss the Modification Proposal.

The Modification Group recommends to the Authority that:

- In order to prevent system prices being 'distorted' by spurious Acceptances, the Balancing and Settlement Code should be amended to exclude from all aspects of the price-setting calculation setting any Bid-Offer Acceptance with a volume of less than a Spurious Acceptance Threshold. (This a variant to Option 2. Option 2 was proposed by NGC described within the supporting documentation to the Modification Proposal P10);
- the Balancing and Settlement Code should be amended to allow the Panel from time to time to set the value of the Spurious Acceptance Threshold;
- the Spurious Acceptance Threshold should initially be set to 1 MWh.
- the above changes to the Balancing and Settlement Code should come into effect on the Settlement day from the date on which the Modification Proposal was raised i.e. 2nd May 2001. However, the Modification Group recommended that there should be an adequate level of testing, which should be considered in setting the effective date.

The change to the BSC will require corresponding changes to the Settlement Administration Agent (SAA) and Balancing Mechanism Reporting Agent (BMRA) software. ELEXON therefore further recommends that:

- the changes to BMRA and SAA software be implemented in time for the Initial Settlement run for the effective date of the change. It should be noted, however, that there will be a period prior to implementation of the software change in which prices reported on BMRA and the Interim Information run will not include the P10 changes;
- dependent on the agreed effective date and the implementation date (reflecting time required for development and testing of the solution), provisions may be required in the Balancing and Settlement Code recognising that the revised rules may not come into effect until later Reconciliations for a number of Settlement Days. *(It should be noted that discussions are taking place with the Logica Consortium to establish the fastest possible timescales for development and testing).*

¹ Specifically, times are specified to the nearest minute, and acceptance levels as a whole number of MW. However, the issue is a generic one, and would still arise even if acceptance data could be provided at a finer level of granularity.

3 PURPOSE AND SCOPE OF THE REPORT

BSC Section F sets out the procedures for progressing proposals to amend the BSC (known as 'Modification Proposals'). These include procedures for proposing, consulting on, developing, evaluating and reporting to the Authority on potential modifications.

The BSC Panel is charged with supervising and implementing the modification procedures. ELEXON provides the secretariat and other advice, support and resource required by the Panel for this purpose. In addition, if a modification to the Code is approved by the Authority, ELEXON is responsible for overseeing the implementation of that amendment (including any consequential changes to systems, procedures and documentation).

The modification procedures culminate in a modification report to the Authority, which normally contains the Panel's recommendation on whether or not a proposed modification should be approved and a proposed date for its implementation, together with a detailed assessment of the proposal in question. The report forms the basis upon which the Authority will decide whether to approve, direct or reject a modification proposal.

The Transmission Company or ELEXON may recommend that a Modification Proposal be treated as urgent, subject to approval by the Authority. The procedure for progressing an Urgent Modification Proposal is set out in Sections F2.9 and B4.6 of the Code. These urgent procedures allow the normal modification procedures to be circumvented as necessary to fit with the urgency of the matter. In such cases, the Authority will confirm the timetable and procedure that should apply. The timetable and procedure directed by the Authority must be adhered to, along with any other special instructions. A statement containing the reasons why the Panel (or Panel Chairman) consider the Proposal should be treated as urgent must be included in the Urgent Modification Report, together with a description of the extent to which the procedure followed deviated from the normal modification procedure.

Depending on the urgency of the matter, it may not be possible to establish a Modification Group or undertake detailed assessment of the modification proposal. The level of detail and analysis presented in this Urgent Modification Report therefore represents the full extent of relevant information regarding the modification proposal that could be collated within the time available.

4 DESCRIPTION OF PROPOSED MODIFICATION

On 2nd May 2001 the Transmission Company submitted Modification Proposal P10. The intention of this Proposal was to prevent the occurrence of price spikes caused by spurious Bid/Offer Acceptances registered by the settlement software as a result of truncating National Grid instructions to a whole number of minutes or an integer volume of megawatts. Attached to the Modification Proposal was a paper describing two possible options for amending the BSC (see Annex 5):

- Option 1 was to amend the settlement software so that it calculates the length of time corresponding to each accepted Bid/Offer pair, and excludes from the price setting calculation those with a duration of less than 1 minute.
- Option 2 was to invoke the default price calculation if the total volume of Bids or Offers in the Settlement Period was less than 1 MWh (for SBP), or greater than -1 MWh (for SSP). Currently the threshold is zero in each case.

The Modification Proposal stated that option 1 would be marginally more effective (in the sense of excluding spurious Acceptances, and not excluding genuine Acceptances). However, it also stated that this option would be more complex to implement, and therefore recommended option 2.

A copy of the Modification proposal is available on the ELEXON website (www.elexon.co.uk) and is replicated in Annex 5 of this document. Details of the Modification Proposal considered by the Modifications Group are described in Annex 1 of this document.

5 EXTENT TO WHICH THE PROPOSED MODIFICATION WOULD BETTER FACILITATE THE APPLICABLE BSC OBJECTIVES

The Proposer states that:

The proposal improves the transparency in the calculation of System Buy Price and System Sell Price by removing a potential cause of price spikes that is not related to the economics of system balancing. It therefore meets the objective of "promoting efficiency in the implementation and administration of the balancing and settlements agreement." (Condition 7A (3) (d) of the Transmission Licence).

6 STATEMENT OF URGENCY

The Modification Proposal has been treated as urgent on the basis that the proposal seeks to prevent perceived distortions in the imbalance price calculations. The supporting data in Annex 3 indicates that this issue is having significant effect on prices. Furthermore, the issue has the potential at any point in the future to create an extreme distortion in prices (e.g. a price of £999,999/MWh). Not only would such a distortion be extremely disruptive to the efficient operation of the imbalance market, but the risk of such a distortion may act as a barrier to new entrants into the market. It was therefore considered that a failure to address this issue urgently would be inconsistent with the achievement of the Applicable BSC Objectives.

The Transmission Company recommended that Modification Proposal P10 be treated as an Urgent Modification Proposal.

The BSC Panel Chairman sought the views of Panel Members all of whom supported the recommendation that the Modification Proposal be treated as urgent.

The Panel recommendation to treat the Modification as Urgent has been ratified by the Authority.

7 DETAIL OF PROCEDURE AND TIMETABLE FOLLOWED

The key steps that have been adopted in progressing this Urgent Modification Proposal are as follows:

- i) On 2nd May 2001 the Transmission Company raised Modification Proposal P10 - Eliminating Imbalance Price Spikes caused by truncating effects with ELEXON;
- ii) On 3rd May 2001, the Transmission Company recommended that Modification Proposal P10 be treated as an Urgent Modification Proposal;
- iii) On the 3rd May 2001, the BSC Panel Chairman sought the views of Panel Members all of whom supported the recommendation that the Modification Proposal be treated as urgent (In accordance with the procedures set out in F2.9 of the BSC).
- iv) On the 4th May, the Panel recommendation to treat the Modification as Urgent was subsequently ratified by the Authority. A Modification Group was established (based on the membership of group that considered Modification Proposal P3) with the membership agreed by the Panel Chairman and the Group were subsequently notified of a meeting date the following week;
- v) On the 8th May, the Authority agreed the process and timescale as described below:
- vi) An initial assessment of the proposal was prepared by ELEXON for consideration by a Modification Group.
- vii) This initial assessment was presented to a Modification Group on the 9th May 2001 and considered by the Group. The Group comprised the Proposer (NGC representative), Ofgem representatives, industry experts and ELEXON technical experts; a full listing of members is given in Annex 4;
- viii) Following discussion at the Modification Group meeting, this Urgent Modification Report was drafted and issued for consultation on 9th May 2001, with a request for comments by 08:00hrs on 11th May 2001;
- ix) *Comments received as a result of the consultation were collated and are summarised in Annex 6. Annex 7 contains all consultation responses received [TBA].*
- x) *This report will then be issued to Ofgem for consideration by 18:00hrs on 11th May 2001.[TBA]*

Deviations from the normal Modification Procedures (as prescribed by Section F of the BSC) were as follows:

- i) The Initial Written Assessment was presented directly to the Modification Group, rather than to the BSC Panel;
- ii) The membership of the Modification Group was agreed by the BSC Panel Chairman, rather than by the BSC Panel;

- iii) Representations of Parties and interested third parties were not obtained and assessed by the Modification Group. However a consultation exercise was conducted on a draft of this report and were considered by ELEXON and presented to Ofgem, following the Modifications Group deliberations;
- iv) No Assessment Report has been produced, but limited analysis, supporting the recommendations, has been undertaken and is included in Annex 3 of this document; and
- v) This report has been presented directly to Ofgem and has not been formally considered by the Panel.

8 RECOMMENDATION

The views of the Modification Group meeting on 9th May 2001 can be summarised as follows. (Further details can be found in Annex 1):

- The Modifications Group (including the Modification Proposer) supported the implementation of an option in which individual Bid-Offer Acceptances are excluded from the price calculation if their volume is less than below a given level (with the option to adjust this level in light of experience). Other aspects of the settlement process would not be affected e.g. the Acceptances would still be subject to Balancing Mechanism payments. This option can be regarded as a variant of Option 2 (Option 2a, see Annex 1), as defined in the Modification Proposal. Its advantage over Option 2 is that it prevents spurious Acceptances having any impact on system prices (which Option 2 does not);
- The Group recommended that the change should become effective as early as possible. They therefore proposed that the effective date should be the settlement date on which the Modification Proposal was raised i.e. 2nd May 2001. However, the Group agreed that the software changes required should be adequately tested, and that the effective date should reflect the requirements of testing;
- The Group noted that any change to the rules for setting system prices raised the issue of whether to include the same changes in the prices used for the Transmission Company incentive scheme, but recommended that implementation of the Modification should not be delayed as a result of this issue;

The change to the BSC will require corresponding changes to the Settlement Administration Agent (SAA) and Balancing Mechanism Reporting Agent (BMRA) software. ELEXON therefore further recommends that:

- the changes to BMRA and SAA software be implemented in time for the Initial Settlement run for the effective date of the change. It should be noted, however, that there will be a period prior to implementation of the software change in which prices reported on BMRA and the Interim Information run will not include the P10 changes;
- dependent on the agreed effective date and the implementation date (reflecting time required for development and testing of the solution), provisions may be required in the Balancing and Settlement Code recognising that the revised rules may not come into effect until later Reconciliations for a number of Settlement Days. *(It should be noted that discussions are taking place with the Logica Consortium to establish the fastest possible timescales for development and testing).*

The Modification Group did not explicitly discuss the issue of whether any Acceptance below the threshold should be excluded from the price calculation, or only those with a Bid-Offer Pair Number of +1 or -1. Views are invited on this point.

The Modification Group also did not discuss the mechanism for changing the threshold value for spurious Acceptances. The simplest mechanism would be to have a single parameter value, with any change applying to Reconciliation runs as well. It is proposed that this simple mechanism will be included in the initial release of the software, and that the question of whether to build a more sophisticated solution into the software will be pursued outside of the Urgent Modification timescales.

ANNEX 1 – RESULTS OF MODIFICATION GROUP MEETING

Options Considered

The Modification Group discussed the two options described in the attachment to Modification Proposal P10:

- Option 1 was to exclude from the price setting algorithm all Acceptances with a duration of less than one minute; and
- Option 2 was to invoke the default price calculation if the total volume of Bids or Offers in the Settlement Period was less than 1 MWh (for SBP), or greater than –1 MWh (for SSP).

The Group noted that these options have the following disadvantages:

- Option 1 is significantly more complex to implement in the systems operated by the Central Service Providers. It is believed that it may not remove all spurious Acceptances, particularly in cases where the Final Physical Notification (FPN) and the Acceptance are both ramping, and therefore have an extremely small megawatt difference over a significant period of time;
- Option 2 does not entirely remove the impact of spurious Acceptances on prices, in that a spurious Acceptance could still impact the price if the total volume of Acceptances exceeded 1 MWh, or if the spurious Acceptance was tagged for arbitrage and then set the level of a default price.

The Group therefore considered two further options, which can be considered as variants on Option 2:

- Option 2A was to remove from the system price calculation individual Acceptances whose volume was less than 1 MWh (for an Offer), or greater than –1 MWh (for a Bid);
- Option 2B was the same as Option 2, but with an additional check to prevent spurious Acceptances that are tagged for arbitrage from setting the ceiling or floor for a default price.

The Modification Group (including the Proposer) agreed that Option 2A was the preferred of the four options, in that it removed fully the price distortions caused by spurious Acceptances.

The Group further agreed that:

- The “1 MWh” level should be a parameter set from time to time by the BSC Panel, rather than a value ‘hard-coded’ into the BSC (Initially set to ‘1MWh’). This would allow the threshold to be “fine-tuned” based on market experience;
- Prices that are below the threshold should be removed from all aspects of the price-setting calculation. In particular, they should not be treated as arbitrage tagged for purposes of calculating default prices.

The Modification Group noted the initial view of the Logica Consortium representative stated that option 2 was the simplest to implement; option 2A being slightly more complex; option 2B more complex; and option 1 the most complex.

Implementation Date

The Group recommended that the change be implemented on a Settlement Day basis, rather than a Calendar Day basis such that it did not apply to Reconciliation runs for settlement dates prior to the change coming into effect.

The main reasons for this are as follows:

- A Calendar Day based implementation would result in a retrospective amendment to the price setting mechanism which would date back to market start-up.
- Section U2.1.3 of the BSC states that any Reconciliation shall be carried out in accordance with the provisions of the Code prevailing at the Settlement Day in question, and not the provisions as modified by any subsequent Code Modification, unless the relevant Code Modification provided otherwise.

The Modification Group recommended that the change should be made effective on the earliest Settlement Date that is possible, subject to the above. The Group therefore proposed that the effective date should be the settlement date on which the Modification Proposal was raised i.e. 2nd May 2001.

However, the Group noted that the important of adequate testing of the changes to systems operated by the Central Service Providers, and recommended that the implementation approach should be reflect this.

Interaction with Transmission Company Incentive Scheme

The Group noted that the draft Transmission Company incentive scheme references system prices calculated in accordance with the BSC in effect at the start of the year. Any change to the price rules, such as P10, therefore raises possible questions in relation to this scheme. The view of the Group was that this issue was outside their terms of reference. They did however recommend that this potential issue should not cause the implementation of P10 in the BSC to be delayed.

ANNEX 2 – LEGAL TEXT TO GIVE EFFECT TO THE PROPOSED MODIFICATION

The legal text required to give effect to this change has not yet been drafted. However, it is anticipated that the following changes will be required:

- A new parameter, the Spurious Acceptance Threshold (SAT), will be added to Annex X-2 of the BSC.
- A process will be added to Section T of the BSC allowing the BSC Panel to set the value of the Spurious Acceptance Threshold, and to change it.
- A new section will be inserted into Annex T-1, allowing for Spurious Bid and Offer Acceptances to be tagged², prior to Arbitrage and Trade Tagging. An Accepted Offer QAO_{ij}^n will be tagged as Spurious if it is less than SAT, and an Accepted Bid QAB_{ij}^n will be tagged as Spurious if it is greater than $-SAT$.
- This new section in Annex T-1 will include a statement that the process of tagging Spurious Offers will not apply to settlement runs performed prior to a date set by the Panel (the intention being that the Panel will set this date to the calendar date on which the software amendments are made, in the event that this date is after the Initial Settlement Run for the effective date of the change).
- The remaining sections of Annex T-1 will be amended to exclude Acceptances tagged as Spurious from the Arbitrage and Trade Tagging processes.
- Sections T4.4.5 and T4.4.6 will be amended to exclude Spurious Acceptances from the SSP and SBP calculations (in the same way that Arbitrage and Trade Tagged Acceptances are excluded currently).

² As noted previously, views are invited on whether the tagging process should apply to all Bid and Offer Acceptances, or only those with a Pair Number of 1 of -1 .

ANNEX 3 – AVAILABLE SUPPORTING INFORMATION AND DATA

In order to assess the impact of the P10 issue on prices, the ELEXON market monitoring team have used the data in their market monitoring database (for the first thirty days of NETA) to estimate the number of Settlement Periods affected. The results of this analysis can be summarised as follows:

- 32 of the 1440 Settlement Periods had a SBP calculated from less than 1MWh of trades, and the average price in these periods (excluding those before 5th April) was £37.65/MWh. If P010 was implemented these would be replaced by default prices. The average default price over the same period was £11.67/MWh.
- 16 of the 1440 Settlement Periods had a SSP calculated from less than 1MWh of trades, and the average price in these periods (excluding those before 5th April) was £6.94/MWh. If P010 was implemented these would be replaced by default prices. The average default price over the same period was £11.25/MWh.

The analysis also attempted to identify the largest price spikes caused by the P10 issue. The largest SBP values that were caused by spurious acceptances are shown in the following table. Note that the extremely high price spike on 30th March was caused by a combination of the P010 issue and the P003 issue, and so wouldn't have occurred under the current BSAD Methodology:

SBP Spikes Caused by Spurious Acceptances			
Date	Period	TQPAO	SBP
30 th March	25	0.483	1771.83
11 th April	31	0.408	275.00
1 st April	14	0.017	87.89
1 st April	16	0.427	70.00
1 st April	17	0.025	70.00

Similarly, the following are the smallest (i.e. most negative) SSP values caused by spurious acceptances:

SSP Spikes Caused by Spurious Acceptances			
Date	Period	TQPAB	SSP
28 th March	6	-0.005	-100.00
29 th March	6	-0.004	-100.00
22 nd April	42	-0.435	-59.88
25 th April	4	-0.078	-33.80
8 th April	38	-0.383	0.00

It would therefore appear that the P10 issue is causing price spikes with a material impact on settlement; but that it is not responsible for the most extreme price spikes (which are caused by genuinely intended acceptances of high-priced Bids or Offers).

ANNEX 4 – ATTENDEES OF MODIFICATIONS GROUP

P10 Modifications Group Attendance

Member	Organisation	Attendance
Ian Moss	APX	X
Andrew Murray	Axia Energy	X
Mark Trott	BGT	Yes
Martin Mate	British Energy Group	X (email: supports mod)
Maurice Smith	Campbell Carr	Yes
Libby Glazebrook	Edison Mission Energy	X
Paul Dawson	Enron	Christopher Day
Paul Mott	London Electricity	X
Tony Diccio	Powergen	James Hawkins
Steve Wilkin	St Clements Services	Yes
Ben Willis	Yorkshire Electricity	Yes
Peter Bingham	Transmission Company (Proposer)	Yes
Adam Higginson	Ofgem	Yes
Andrew Shaw	Ofgem (Caminus)	Yes

Attendees	
Justin Andrews	ELEXON (Chairman)
Gwilym Rowlands	ELEXON
John Lucas	ELEXON
Nigel Ellis	Logica Consortium

ANNEX 5 – COPY OF MODIFICATION PROPOSAL

Modification Proposal	MP No: P10 <i>(mandatory by BSCCo)</i>
Title of Modification Proposal <i>(mandatory by proposer)</i> : Eliminating Imbalance Price Spikes Caused By Truncating Effects	
Submission Date <i>(mandatory by proposer)</i> : 2 May 2001	
Description of Proposed Modification <i>(mandatory by proposer)</i> : Modification of the SBP and SSP calculations to remove price spikes caused by spurious Bid/Offer Acceptances registered by the settlement software as a result of truncating National Grid instructions to a whole number of minutes or an interger volume of megawatts	
Description of Issue or Defect that Modification Proposal Seeks to Address <i>(mandatory by proposer)</i> : See the attachement	
Impact on Code <i>(optional by proposer)</i> : Modification required to calculation of System Buy Price and System Sell Price in Section T Paragraphs 4.4 of the Code	
Impact on Core Industry Documents <i>(optional by proposer)</i> : None	
Impact on BSC Systems and Other Relevant Systems and Processes Used by Parties <i>(optional by proposer)</i> : The software calculating System Sell Price and System Buy Price will need to be altered	
Impact on other Configurable Items <i>(optional by proposer)</i> : None	
Justification for Proposed Modification with Reference to Applicable BSC Objectives <i>(mandatory by proposer)</i> : The proposal improves the transparency in the calculation of System Buy Price and System Sell Price by removing a potential cause of price spikes that is not related to the economics of system balancing. It therefore meets the objective of "promoting efficiency in the implementation and administration of the balancing and settlements agreement."	
Details of Proposer: <p style="text-align: center;">Name: Mike Calviou</p> <p style="text-align: center;">Organisation: National Grid</p> <p style="text-align: center;">Telephone Number: 02476 423958</p> <p style="text-align: center;">Email Address: mike.calviou@uk.ngrid.com</p>	

Modification Proposal	MP No: P10 <i>(mandatory by BSCCo)</i>
Details of Proposer's Representative:	
Name: Mike Calviou	
Organisation: National Grid	
Telephone Number: 02476 423958	
Email Address: mike.calviou@uk.ngrid.com	
Details of Representative's Alternate:	
Name: Peter Bingham	
Organisation: National Grid	
Telephone Number: 02476 423054	
Email Address: peter.bingham@uk.ngrid.com	
Attachments: YES	
If Yes, Title and No. of Pages of Each Attachment:	
Imbalance Price Calculations - BSC Modification Proposal, Eliminating imbalance price spikes caused by truncating effects, 9 Pages	

The following paper was attached to the Modification Proposal:

2 May 2001

THE NATIONAL GRID COMPANY plc

**Imbalance Price Calculations - BSC Modification Proposal
Eliminating imbalance price spikes caused by truncating effects
(Paper by National Grid)**

The paper describes two options for modifying the BSC to remove imbalance price spikes that can occur as a result of spurious Bid/Offer Acceptances caused by truncating National Grid instructions to a whole number of minutes or an integer volume of megawatts. The first option targets these spurious effects by removing Bid/Offer acceptances of less than 1 minute in duration. This is our preferred solution but requires complex modifications to the BSC and the associated settlement software.

The second option removes Bid/Offer acceptances with a total volume less than 1 MWh. This solution should eliminate the spurious effects, provided by a very simple modification to the BSC and associated settlement software. The disadvantage of this option is that it could also eliminate any genuine, albeit unlikely, Bid/Offer acceptances with a volume less than 1MWh. However, given the need for a short-term solution to remove price spikes, we propose that the BSC be modified in accordance with this option.

I. INTRODUCTION

The truncating of National Grid acceptances to a whole number of minutes or an integer volume of megawatts can result in the settlement software registering a "spurious" Bid/Offer Acceptance of a very small Bid/Offer volume in addition to the intended acceptance. If this is the only volume 'accepted' in that direction, an extreme Bid/Offer price combined with a very small volume (typically a fraction of a MWh) can lead to a price spike that is totally unrelated to the economics of system balancing. For example, a volume of 50kWh at £1000/MWh might be registered, implying a balancing cost of £50, but the imbalance price would be set to £1000/MWh.

As with the price spikes caused by BSAD data which are currently being addressed, we do not regard such spikes as providing the correct economic message for participants to self-balance, and instead may create an artificial incentive for participants to adjust their position avoid exposure to imbalance price spikes. This paper describes two options for modifying the BSC to remove these effects.

II. OPTION 1 - REMOVE BID/OFFER VOLUMES < 1 MINUTE

The spurious Bid/Offer Acceptance volumes resulting from truncating National Grid instructions to the nearest minute or megawatt are themselves typically less than 1 minute in duration. Our preferred approach to the eliminating associated price spikes is to remove all individual Bid/Offer Acceptances less than 1 minute in duration from the calculation of imbalance prices. This could be achieved by modifying Section T of the BSC in accordance with Appendix A.

Under this option, Section T, Paragraph 3.8 of the BSC would be modified to identify the duration of all Bid and Offer Acceptances as the Price Period Accepted Offer Flag Volume (FLAGOknij) and Price Period Accepted Bid Flag Volume (FLAGBknij). The Imbalance Price Period Offer Volume (QAOPknij) or Imbalance Price Period Accepted Bid Volume (QABPknij) would be set to the volume of the corresponding Bid/Offer Acceptance unless the corresponding Flag Volume is less than 1 minute in duration, in which case it would be set to zero. The Imbalance Price Period

Offer Volume (QAOPknij) or Imbalance Price Period Accepted Bid Volume (QABPknij) would be used to calculate Imbalance Prices SSP and SBP in Paragraph 4.4, replacing the Period Accepted Offer Volume (QAOKnij) and Period Accepted Bid Volume (QABknij).

The key features of this option are:

- All spurious Bid/Offer Acceptances caused by truncating National Grid instructions should be removed from the calculation of imbalance prices.
- The de minimis check would be applied on an acceptance-by-acceptance basis, not all acceptances of a particular Bid-Offer Pair in a half-hour.
- Genuine Bid/Offer Acceptances with a duration of < 1 minute are highly unlikely, therefore this option is unlikely to eliminate any genuine Bid/Offer Acceptances.
- De minimis Bid/Offer Acceptances would be excluded from price calculation, but payments associated with Bid/Offer Acceptances would be unaffected.
- Complex modification to both the BSC and the associated settlement software would take time to implement, thus allowing price spikes relating to this effect to continue in the short-term.

III. OPTION 2 - REMOVE BID/OFFER VOLUMES < 1MWh

Spurious Bid/Offer Acceptances are typically very small in volume, and only make a notable impact on imbalance prices when they are the only Bid/Offer registered in a given direction. A simple approach to removing the resulting price spikes is to disregard total acceptance volumes < 1MWh when calculating imbalance prices, and set the imbalance price to a default value.

Modification to the SBP Calculation

Under Section T, Paragraph 4.4 of the BSC, System Buy Price is calculated as follows:

$$SBP_j = \left\{ \sum_i \sum^n \{ QAO_{ij}^n * PO_{ij}^n * TLM_{ij} \} + BCA_j \right\} / \left\{ \sum_i \sum^n \{ QAO_{ij}^n * TLM_{ij} \} + BVA_j \right\}$$

If there are no actual Offer acceptances or energy purchases, $\{ \sum_i \sum^n \{ QAO_{ij}^n * TLM_{ij} \} + BVA_j \}$ should equal zero and default rules for calculating SBP apply. However, the truncating of Bid Acceptance times can lead to the spurious acceptance of very small Offer volumes being registered by the settlement software. The equation above then applies, potentially setting the imbalance price to the price of the spurious Offer accepted.

This could be overcome by modifying Paragraph 4.4.5 as detailed in Appendix B to increase the de minimis volume for which the default rules apply from zero to 1 MWh. This should eliminate the spurious acceptance of Offer volumes and avoid the associated price spikes.

Modification to the SSP Calculation

It is also possible for the spurious acceptance of very small Bid volumes to occur and to affect the calculation of SSP. This could be overcome by modifying Paragraph 4.4.5 as detailed in

Appendix B to increase the de minimis volume for which the default rules apply from zero to 1 MWh.

The key features of this option are:

All spurious Bid/Offer Acceptances caused by truncating National Grid instructions should be removed from the calculation of imbalance prices.

The de minimis check would be applied the aggregate of all acceptances in a given half-hour rather than on a more sophisticated acceptance-by-acceptance basis.

Genuine Bid/Offer Acceptances with a volume of < 1MWh , although unlikely, would also be removed from the imbalance calculation.

Payments associated with Bid/Offer Acceptances would be unaffected

The required minor modifications to the BSC and associated settlement software could be implemented quickly, thus eliminating price spikes caused by these distortional effects in the short-term.

IV. PROPOSAL

Option 1 provides a more sophisticated solution in identifying spurious Bid/Offer Acceptances and removing these from the imbalance calculations. It carries very little risk of removing genuine Bid/Offer Acceptances. Option 2 is far simpler, applying a default price if the total volume of Acceptances in a given half-hour is less than 1MW. However, this option would remove genuine Bid Offer Acceptances from the imbalance price calculation. For this reason Option 1 is our preferred option.

Although both options run the risk of excluding genuine Bid/Offer Acceptances, and not excluding all spurious Bid/Offer Acceptances, we regard Option 1 as being marginally more effective.

However, Option 1 is complex and will take time to implement. Rather than allowing these distortional effects and associated price spikes to continue, we propose that the more straightforward Option 2 modification be adopted as soon as possible.

In the longer-term, it should be considered whether Option 1 should be pursued, or whether National Grid's operational systems could be modified to remove the truncating effect altogether.

APPENDIX A - OPTION 1 MODIFICATION PROPOSAL

Under the Option 1 proposal, Section T, Paragraph 3.8 of the BSC would be replaced as follows:

3.8	Determination of Period Accepted Offer Volume (QAO^{kn}_{ij}) and Period Accepted Bid Volume (QAB^{kn}_{ij})
3.8.1	In respect of each Settlement Period, for each BM unit i , each Bid-Offer Pair n and each Acceptance k , the Period Accepted Offer Volume (QAO^{kn}_{ij}) shall be established by integrating the accepted Offer Volume ($qAO^{kn}_{ij}(t)$) over all spot times in the Settlement Period.
3.8.1	In respect of each Settlement Period, for each BM unit i , each Bid-Offer Pair n and each Acceptance k , the Period Accepted Bid Volume (QAB^{kn}_{ij}) shall be established by integrating the accepted Bid Volume ($qAB^{kn}_{ij}(t)$) over all spot times in the Settlement Period.
3.8A	Determination of Price Accepted Offer Volume ($qAOP^{kn}_{ij}(t)$) and Price Accepted Bid Volume ($qABP^{kn}_{ij}(t)$)
3.8A.1	If, in relation to each Bid-Offer Acceptance k and Bid-Offer Pair n , for any spot time t <ul style="list-style-type: none"> (i) $qAO^{kn}_{ij}(t) \neq 0$, then, $qAOP^{kn}_{ij}(t) = 1$, otherwise (ii) $qAOP^{kn}_{ij}(t) = 0$.
3.8A.2	If, in relation to each Bid-Offer Acceptance k and Bid-Offer Pair n , for any spot time t <ul style="list-style-type: none"> (i) $qAB^{kn}_{ij}(t) \neq 0$, then, $qABP^{kn}_{ij}(t) = 1$, otherwise (ii) $qABP^{kn}_{ij}(t) = 0$.
3.8B	Determination of Price Period Accepted Offer Flag Volume ($FLAGO^{kn}_{ij}$) and Price Period Accepted Bid Flag Volume ($FLAGB^{kn}_{ij}$)
3.8B.1	In respect of each Settlement Period, for each BM Unit i , each Bid-Offer Pair n and each Acceptance k , the Price Period Accepted Offer Flag Volume ($FLAGO^{kn}_{ij}$) shall be established by integrating the Price Accepted Offer Volume ($qAOP^{kn}_{ij}(t)$) over all spot times in the Settlement Period.
3.8B.2	In respect of each Settlement Period, for each BM Unit i , each Bid-Offer Pair n and each Acceptance k , the Price Period Accepted Bid Flag Volume ($FLAGB^{kn}_{ij}$) shall be established by integrating the Price Accepted Bid Volume ($qABP^{kn}_{ij}(t)$) over all spot times in the Settlement Period.
3.8C	Determination Imbalance Price Period Accepted Offer Volume ($QAOP^{kn}_{ij}$) and Imbalance Price Period Accepted Bid Volume ($QABP^{kn}_{ij}$)
3.8C.1	In respect of each Settlement Period, for each BM Unit i , each Bid-Offer Pair n

and each Acceptance k , the Imbalance Price Period Accepted Offer Volume ($QAOP^{kn}_{ij}$) shall be established as follows:

- (i) if $FLAGO^{kn}_{ij} > 1/30$ hours, then Imbalance Price Period Accepted Offer Volume ($QAOP^{kn}_{ij}$) shall be determined by integrating the Accepted Offer Volume ($qAO^{kn}_{ij}(t)$) over all spot times in the Settlement Period; otherwise
- (ii) the Imbalance Price Period Accepted Offer Volume ($QAOP^{kn}_{ij}$) shall be set to zero.

3.8C.2 In respect of each Settlement Period, for each BM Unit i , each Bid-Offer Pair n and each Acceptance k , the Imbalance Price Period Accepted Bid Volume ($QABP^{kn}_{ij}$) shall be established as follows:

- (i) if $FLAGB^{kn}_{ij} > 1/30$ hours, then Imbalance Price Period Accepted Bid Volume ($QABP^{kn}_{ij}$) shall be determined by integrating the Accepted Bid Volume ($qAB^{kn}_{ij}(t)$) over all spot times in the Settlement Period; otherwise
- (ii) the Imbalance Price Period Accepted Bid Volume ($QABP^{kn}_{ij}$) shall be set to zero.

3.8D Determination of Price Period BM Unit Total Accepted Offer Volume ($QAOP^n_{ij}$) and Price Period BM Unit Total Accepted Bid Volume ($QABP^n_{ij}$)

3.8D.1 In respect of each Settlement Period, for each BM Unit i , the total MWh volume each Offer accepted from all Acceptances shall, for the purposes of determination of energy imbalance prices, be the Price Period BM Unit Total Accepted Offer Volume ($QAOP^n_{ij}$) and shall be established as follows:

$$QAOP^n_{ij} = \sum^k QAOP^{kn}_{ij}$$

where \sum^k represents the sum over all Acceptances within the Settlement Period.

3.8D.2 In respect of each Settlement Period, for each BM Unit i , the total MWh volume each Bid accepted from all Acceptances shall, for the purposes of determination of energy imbalance prices, be the Price Period BM Unit Total Accepted Bid Volume ($QABP^n_{ij}$) and shall be established as follows:

$$QABP^n_{ij} = \sum^k QABP^{kn}_{ij}$$

where \sum^k represents the sum over all Acceptances within the Settlement Period.

Section T, Paragraphs 4.4 of the BSC would require modification to replace $QAOnij$ with $QAOPnij$ and $QABnij$ with $QABPnij$ as follows:

4.4 Determination of Imbalance Prices (SBP_i and SSP_i)

4.4.1 In respect of each Settlement Period, the System Total Accepted Offer Volume will be determined as follows:

$$TQAO_j = \sum_i \sum^n QAOP_{ij}^n$$

where \sum_i represents the sum over all BM units and \sum^n represents the sum over all Bid-Offer Pair Numbers for the BM Unit.

4.4.2 In respect of each Settlement Period, the System Total Accepted Bid Volume will be determined as follows:

$$TQAO_j = \sum_i \sum^n QABP_{ij}^n$$

where \sum_i represents the sum over all BM units and \sum^n represents the sum over all Bid-Offer Pair Numbers for the BM Unit.

4.4.3 Unchanged

4.4.4 Unchanged

4.4.5 In respect of each Settlement Period, if $\{ \sum_i \sum^n \{ QAOP_{ij}^n * TLM_{ij} \} + BVA_i \}$ not equal to zero then the System Buy Price will be determined as follows:

$$SBP_j = \frac{\sum_i \sum^n \{ QAOP_{ij}^n * PO_{ij}^n * TLM_{ij} \} + BCA_j}{\sum_i \sum^n \{ QAOP_{ij}^n * TLM_{ij} \} + BVA_j}$$

Where \sum_i represents the sum over all BM Units and where \sum^n represents the sum over those accepted Offers that are not Arbitraged Accepted Offers and not Trade Tagged Offers.

If for any Settlement Period $\{ \sum_i \sum^n \{ QAOP_{ij}^n * TLM_{ij} \} + BVA_i \}$ is equal to zero, then :

- (a) if for that Settlement Period $\{ \sum_i \sum^n \{ QABP_{ij}^n * TLM_{ij} \} + SVA_i \}$ is equal to zero, the System Buy Price for that Settlement Period will be equal to zero;
- (b) otherwise, the System Buy Price will be determined as the maximum of System Sell Price and:
 - (i) the Offer Price of the cheapest Offer available in that Settlement Period:
 - (1) which has a positive Bid-Offer Pair Number; and
 - (2) which has an Offer Price greater than the Offer Price of any Offer which is an Arbitrage Accepted Offer in respect of that Settlement Period; and
 - (3) for which the value of Bid-Offer Volume ($qBO_{ij}^n(t)$) is greater than zero for all spot times t in that Settlement Period;

(ii) or, if no such Offer exists, zero.

4.4.6 In respect of each Settlement Period, if $\{ \sum_i \sum^n \{QABP_{ij}^n * TLM_{ij}\} + SVA_i \}$ is not equal to zero then the System Sell Price will be determined as follows:

$$SSP_j = \left\{ \sum_i \sum^n \{QABP_{ij}^n * PB_{ij}^n * TLM_{ij}\} + SCA_j \right\} / \left\{ \sum_i \sum^n \{QABP_{ij}^n * TLM_{ij}\} + SVA_j \right\}$$

Where \sum_i represents the sum over all BM Units and Where \sum^n represents the sum over those accepted Bids that are not Arbitrated Accepted Bids and not Trade Tagged Bids.

If for any Settlement Period $\{ \sum_i \sum^n \{QABP_{ij}^n * TLM_{ij}\} + SVA_i \}$ is equal to zero, then:

- (a) if for that Settlement Period $\{ \sum_i \sum^n \{QAOP_{ij}^n * TLM_{ij}\} + BVA_i \}$ is equal to zero, the System Sell Price for that Settlement Period will be equal to zero;
- (b) otherwise, the System Sell Price will be determined as the maximum of System Buy Price and:

- (i) the Bid Price of the most expensive Bid available in that Settlement Period:
- (1) which has a negative Bid-Offer Pair Number; and
 - (2) which has an Bid Price less than the Bid Price of any Bid which is an Arbitrage Accepted Bid in respect of that Settlement Period; and
 - (3) for which the value of Bid-Offer Volume ($qBO_{ij}^n(t)$) is less than zero for all spot times t in that Settlement Period;

(ii) or, if no such Bid exists, zero.

4.4.7 In respect of each Settlement Period, the Total Accepted Priced Offer Volume will be determined as follows:

$$TQPAO_i = \sum_i \sum^n QAOP_{ij}^n$$

Where \sum_i represents the sum over all BM units and \sum^n represents the sum over those accepted Offers that are not Arbitrated Accepted Offers and not Trade Tagged Offers.

4.4.8 In respect of each Settlement Period, the Total Accepted Priced Offer Volume will be determined as follows:

$$TQPAO_i = \sum_i \sum^n QABP_{ij}^n$$

Where \sum_i represents the sum over all BM units and \sum^n represents the sum over

those accepted Bids that are not Arbitrated Accepted Bids and not Trade Tagged Bids.

4.4.9 In respect of each Settlement Period, the Total Arbitrage Volume will be determined as follows:

$$TAQ_i = \sum_i (\sum_{n^i} QABP_{ij}^{n^i} - \sum_{n^*} QAOP_{ij}^{n^*}) / 2$$

Where \sum_i represents the sum over all BM units and \sum_{n^i} represents the sum over those accepted Bids that are Arbitrated Accepted Bids and \sum_{n^*} represents the sum over those accepted Offers that are Arbitrated Accepted Offers.

4.4.9 In respect of each Settlement Period, the Total Trade Tagged Volume will be determined as follows:

$$TCQ_i = \sum_i (\sum_{n^i} QABP_{ij}^{n^i} - \sum_{n^*} QAOP_{ij}^{n^*}) / 2$$

Where \sum_i represents the sum over all BM units and \sum_{n^i} represents the sum over those accepted Bids that are Trade Tagged Bids and \sum_{n^*} represents the sum over those accepted Offers that are Trade Tagged Offers.

Annex T-1 would also require modification to align with the modifications detailed above.

APPENDIX B - OPTION 2 MODIFICATION PROPOSAL

Under the Option 2 proposal, Section T, Paragraph 4.4.5 and 4.4.6 of the BSC would be modified as follows:

4.4.5 In respect of each Settlement Period, if $\{ \sum_i \sum^n \{QAO_{ij}^n * TLM_{ij}\} + BVA_i \}$ is **greater than 1MWh** then the System Buy Price will be determined as follows:

$$SBP_j = \left\{ \sum_i \sum^n \{QAO_{ij}^n * PO_{ij}^n * TLM_{ij}\} + BCA_j \right\} / \left\{ \sum_i \sum^n \{QAO_{ij}^n * TLM_{ij}\} + BVA_j \right\}$$

Where \sum_i represents the sum over all BM Units and where \sum^n represents the sum over those accepted Offers that are not Arbitrated Accepted Offers and not Trade Tagged Offers.

If for any Settlement Period $\{ \sum_i \sum^n \{QAO_{ij}^n * TLM_{ij}\} + BVA_i \}$ is **less than or equal to 1MWh**, then :

- (a) if for that Settlement Period $\{ \sum_i \sum^n \{QAB_{ij}^n * TLM_{ij}\} + SVA_i \}$ is greater than or equal to $-1MWh$, the System Buy Price for that Settlement Period will be equal to zero;
- (b) otherwise, the System Buy Price will be determined as the maximum of System Sell Price and:
 - (i) the Offer Price of the cheapest Offer available in that Settlement Period:
 - (1) which has a positive Bid-Offer Pair Number; and
 - (2) which has an Offer Price greater than the Offer Price of any Offer which is an Arbitrage Accepted Offer in respect of that Settlement Period; and
 - (3) for which the value of Bid-Offer Volume ($qBO_{ij}^n(t)$) is greater than zero for all spot times t in that Settlement Period;
 - (ii) or, if no such Offer exists, zero.

4.4.6 In respect of each Settlement Period, if $\{ \sum_i \sum^n \{QAB_{ij}^n * TLM_{ij}\} + SVA_i \}$ is **less than -1MWh** then the System Sell Price will be determined as follows:

$$SSP_j = \left\{ \sum_i \sum^n \{QAB_{ij}^n * PB_{ij}^n * TLM_{ij}\} + SCA_j \right\} / \left\{ \sum_i \sum^n \{QAB_{ij}^n * TLM_{ij}\} + SVA_j \right\}$$

Where \sum_i represents the sum over all BM Units and Where \sum^n represents the sum over those accepted Bids that are not Arbitrated Accepted Bids and not Trade Tagged Bids.

If for any Settlement Period $\{ \sum_{ij}^n \{QAB_{ij}^n * TLM_{ij}\} + SVA_i \}$ is greater than or equal to $-1MWh$, then :

- (a) if for that Settlement Period $\{ \sum_{ij}^n \{QAO_{ij}^n * TLM_{ij}\} + BVA_i \}$ less than or equal to $1MWh$, the System Sell Price for that Settlement Period will be equal to zero;
- (b) otherwise, the System Sell Price will be determined as the maximum of System Buy Price and:
 - (i) the Bid Price of the most expensive Bid available in that Settlement Period:
 - (1) which has a negative Bid-Offer Pair Number; and
 - (2) which has an Bid Price less than the Bid Price of any Bid which is an Arbitrage Accepted Bid in respect of that Settlement Period; and
 - (3) for which the value of Bid-Offer Volume ($qBO_{ij}^n(t)$) is less than zero for all spot times t in that Settlement Period;
 - (ii) or, if no such Bid exists, zero.

ANNEX 6 – SUMMARY OF RESPONSES TO ELEXON CONSULTATION ON P10

ANNEX 7 – RESPONSES TO ELEXON CONSULTATION ON P10