

Single Electricity Market

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| --- |
| Final REcommendation Report  Mod\_06\_18 clarification of marginal energy action price calculation including scenario when all actions are flagged  10 May 2018 |

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Document History

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| --- | --- | --- | --- |
| **Version** | **Date** | **Author** | **Comment** |
| 1.0 | 10 May 2018 | Modifications Committee Secretariat | Issued to Modifications Committee for review and approval |
| 2.0 | 25 May 2018 | Modifications Committee Secretariat | Issued to Regulatory Authorities for final decision |

Reference Documents

|  |
| --- |
| **Document Name** |
| [Trading and Settlement Code](http://www.sem-o.com/MarketDevelopment/MarketRules/TSC.docx) |
| [Modification Proposal](http://www.sem-o.com/MarketDevelopment/ModificationDocuments/Mod_06_18%20-%20Clarification%20of%20Marginal%20Energy%20Action%20Price%20calculation%20including%20scenario%20when%20all%20actions%20are%20flagged.docx) |
| [Presentation](http://www.sem-o.com/MarketDevelopment/ModificationDocuments/Mod_06_18%20Presentation.pptx) |

Table of Contents

[1. MODIFICATIONS COMMITTEE RECOMMENDATION 4](#_Toc513728635)

[**Recommended for approval– Unanimous Vote** 4](#_Toc513728636)

[2. Background 4](#_Toc513728637)

[3. PURPOSE OF PROPOSED MODIFICATION 5](#_Toc513728638)

[**3A.) justification of Modification** 5](#_Toc513728639)

[**3B.) Impact of not Implementing a Solution** 6](#_Toc513728640)

[**3c.) Impact on Code Objectives** 6](#_Toc513728641)

[4. Assessment of Alternatives 6](#_Toc513728642)

[5. Working Group and/or Consultation 6](#_Toc513728643)

[6. impact on systems and resources 6](#_Toc513728644)

[7. Impact on other Codes/Documents 6](#_Toc513728645)

[8. MODIFICATION COMMITTEE VIEWS 6](#_Toc513728646)

[**Meeting 81 – 13 Mach 2018** 6](#_Toc513728647)

[9. Proposed Legal Drafting 7](#_Toc513728648)

[10. LEGAL REVIEW 7](#_Toc513728649)

[11. IMPLEMENTATION TIMESCALE 7](#_Toc513728650)

[1 Appendix 1: Mod\_06\_18 Clarification of Marginal Energy Action Price calculation including scenario when all actions are flagged 8](#_Toc513728651)

# MODIFICATIONS COMMITTEE RECOMMENDATION

## Recommended for approval– Unanimous Vote

|  |  |  |  |
| --- | --- | --- | --- |
| **Recommended for Approval by Unanimous Vote** | | | |
| Kevin Hannafin | Generator Member | Approved |
| Cormac Daly | Generator Member | Approved |
| Brian Mongan | Generator Member | Approved |
| William Steele | Supplier Member | Approved |
| Jim Wynne | Supplier Member | Approved |
| Julie-Anne Hannon (Chair) | Supplier Member | Approved |

# Background

This Modification Proposal was raised by SEMO and was received by the Secretariat on 14 February 2018. This modification has two parts related to the calculation of the Marginal Energy Action Price (PMEA), one which is proposing a different approach be taken in a given scenario, and one which is editing the text to clarify the intended outcome.

First part:

The setting of PMEA in situations where all actions in the ranked set are flagged (i.e. no actions in the ranked set have an associated Imbalance Price Flag (FIP) with a value equal to 1) does not have an explicit provision in the rules. It is proposed that there should be a provision added for this situation, where PMEA is made equal to Price Cap (PCAP) when the Net Imbalance Volume Quantity (QNIV) is positive (more incs than decs), or made equal to Price Floor (PFLOOR) when QNIV is negative (more decs than incs). This is in order to allow the pricing calculations to continue by implementing a pure NIV Tagging approach using the Bid Offer Prices (PBO) of the actions only – the PCAP or PFLOOR values would not continue through the rest of the pricing calculations because of the Replacement Bid Offer Price (PRBO) functionality.

Second part:

The right side of E.3.4.2 should have the closing bracket of each instance of Max(PBO), Min(PBO), at the end of the line, so as to make clear that it is the maximum value of the PBO values that have FIP = 1.

The Modification Proposal was discussed and voted on at Meeting 81 on 13 March 2018.

# PURPOSE OF PROPOSED MODIFICATION

**3A.) justification of Modification**

First part:

* While theoretically there should be no situation where there is not at least one unflagged action, there may be situations which arise in reality where the quantity of the marginal action is below the De Minimis Acceptance Threshold (DMAT), which means that it would be excluded from the ranked set used in the remaining Imbalance Pricing calculations, giving rise to this scenario where all actions in the ranked set are flagged;
* Applying the rules as they are in this situation would mean that if this arises in any five minute period the price should default to the Market Back Up Price (PMBU) for the whole half hour, as there is no provision for the situation and therefore application of the pricing rules has “failed”;
* However what is proposed to be a more theoretically sound approach in this situation would be to set PMEA = PCAP when QNIV is positive, or PMEA = PFLOOR when QNIV is negative. What this means is that the pricing approach can continue, the PRBO process will ensure that this PMEA does not actually influence the final Imbalance Price (all actions will revert to their own PBO for the remainder of the Imbalance Price calculations), and a pure NIV Tagging approach will apply with those prices. This will happen in all situations based on the logic of creating PMEA and PRBO:
  + When QNIV is positive, PMEA is the maximum PBO of unflagged actions, or as per this proposal PCAP if there are no unflagged actions, and PRBO is the minimum of PMEA and PBO. Since the offer price of all actions is required to be less than or equal to PCAP this means that PMEA at PCAP will not continue through the rest of the calculations unless there is actually an action taken on a unit which offered at PCAP;
  + When QNIV is negative, PMEA is the minimum PBO of unflagged actions, or as per this proposal PFLOOR if there are no unflagged actions, and PRBO is the maximum of PMEA and PBO. Since the bid price of all actions would is required to be greater than or equal to PFLOOR this means that PMEA at PFLOOR will not continue through the rest of the calculations unless there is actually an action taken on a unit which bid at PFLOOR.
* This would mean that the Imbalance Price is based on the prices of balancing actions in these situations under a NIV Tagging approach, rather than based on ex-ante market prices under a Market Back Up Price approach, which would also lose the information of the cost of balancing in other five minute Imbalance Pricing Periods within the half hour Imbalance Settlement Period where this situation did not occur as setting PIMB to PMBU is a half hourly occurrence, rather than a five minute occurrence. This change would create an outcome for the Imbalance Price which is closer to the true cost of balancing energy in these scenarios;
* Also, theoretically it would make sense to say that if all actions were indeed flagged, then there is insufficient information from the flagging process to accurately tell what actions are energy vs non-energy, and so in those situations we should apply the NIV Tagging approach to find the energy actions, assuming that the most expensive actions are the non-energy actions. This is what is done in all other situations for mismatched flagged quantities versus the NIV, so it would be just extending it to a further situation where all actions are flagged;
* PMEA is not used in any other area of the Code other than the creation of PRBO and being published, so the setting of it to PCAP or PFLOOR cannot proliferate through any other aspect of the market;
* Numerical examples of the outcomes with the proposal are provided as appendices at the end of this document, Appendix 1 gives an example of a positive QNIV situation, and Appendix 2 gives an example of a negative QNIV situation.

Second part:

As written it looks like PMEA is only set to Max or Min (PBO over all PBO) if FIP =1, which is illogical as it will simply set PMEA to the maximum Bid Offer Price. The intended outcome from a design perspective is clear, which is to take the marginal (max or min) price of all unflagged actions, and this change is to clarify the text to ensure there is no ambiguity.

**3B.) Impact of not Implementing a Solution**

* Additional instances of the imbalance price being the Market Back Up Price, which is less representative of the economic cost of balancing the system in the period where the scenarios discussed arise, while there is actually accurate information available to calculate such an economically representative price through the Bid Offer Prices of Accepted Offers and Bids through a pure NIV Tagging approach;
* Potential requirement for change request or risk of non-compliance of Central Market Systems with the rules, as the systems are currently implementing the proposed approach;
* Ambiguity of outcomes for calculating the Marginal Energy Action Price if reading the rules in isolation without knowledge of the design intent.

**3c.) Impact on Code Objectives**

* to provide transparency in the operation of the Single Electricity Market;
* to facilitate the efficient, economic and coordinated operation, administration and development of the Single Electricity Market in a financially secure manner;

In particular this modification allows for the Imbalance Price to better reflect the true economic costs of the balancing market in a given situation which enhances efficiency, and in removing ambiguity in the rules it provides additional transparency.

1. **Assessment of Alternatives**

N/A

# Working Group and/or Consultation

N/A

# impact on systems and resources

N/A

# Impact on other Codes/Documents

N/A

# MODIFICATION COMMITTEE VIEWS

## Meeting **81 – 13 Mach 2018**

Proposer delivered a [presentation](http://www.sem-o.com/MarketDevelopment/ModificationDocuments/Mod_06_18%20Presentation.pptx) summarising the requirement for this proposal. Proposer advised that the intention of this proposal was to define what should occur in these situations. Questions were raised as to whether the system was able to perform this. It was explained that it was a sensible approach to fully define these areas and small gaps in the algebra were being identified and addressed and that this modification was in line with the system design. Discussion around the plain English explanation of the flagging and tagging process to incorporate this modification also. Proposer advised they will be updating their Flagging and Tagging explanatory document post go-live and bear these issues in mind.

Committee were in agreement to vote on this proposal. The proposal was recommended for approval.

# Proposed Legal Drafting

As set out in Appendix 1.

# LEGAL REVIEW

N/A

# IMPLEMENTATION TIMESCALE

It is proposed that this Modification is implemented on a Trading Day basis with effect from one Working Day after an RA Decision.

# Appendix 1: Mod\_06\_18 Clarification of Marginal Energy Action Price calculation including scenario when all actions are flagged

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **MODIFICATION PROPOSAL FORM** | | | | | |
| **Proposer**  *(Company)* | **Date of receipt**  *(assigned by Secretariat)* | | **Type of Proposal**  *(delete as appropriate)* | | **Modification Proposal ID**  *(assigned by Secretariat)* |
| **SEMO** | **14 February 2018** | | **Standard** | | **06\_18** |
| **Contact Details for Modification Proposal Originator** | | | | | |
| **Name** | | **Telephone number** | | **Email address** | |
| **Martin Kerin** | |  | | [Martin.Kerin@EirGrid.com](mailto:Martin.Kerin@EirGrid.com) | |
| **Modification Proposal Title** | | | | | |
| **Clarification of Marginal Energy Action Price calculation including scenario when all actions are flagged** | | | | | |
| **Documents affected**  *(delete as appropriate)* | | **Section(s) Affected** | | **Version number of T&SC or AP used in Drafting** | |
| **T&SC Part B** | | **E 3.4.2** | | **20** | |
| **Explanation of Proposed Change**  *(mandatory by originator)* | | | | | |
| This modification has two parts related to the calculation of the Marginal Energy Action Price (PMEA), one which is proposing a different approach be taken in a given scenario, and one which is editing the text to clarify the intended outcome.  First part:  The setting of PMEA in situations where all actions in the ranked set are flagged (i.e. no actions in the ranked set have an associated Imbalance Price Flag (FIP) with a value equal to 1) does not have an explicit provision in the rules. It is proposed that there should be a provision added for this situation, where PMEA is made equal to Price Cap (PCAP) when the Net Imbalance Volume Quantity (QNIV) is positive (more incs than decs), or made equal to Price Floor (PFLOOR) when QNIV is negative (more decs than incs). This is in order to allow the pricing calculations to continue by implementing a pure NIV Tagging approach using the Bid Offer Prices (PBO) of the actions only – the PCAP or PFLOOR values would not continue through the rest of the pricing calculations because of the Replacement Bid Offer Price (PRBO) functionality.  Second part:  The right side of E.3.4.2 should have the closing bracket of each instance of Max(PBO), Min(PBO), at the end of the line, so as to make clear that it is the maximum value of the PBO values that have FIP = 1. | | | | | |
| **Legal Drafting Change**  *(Clearly show proposed code change using* ***tracked*** *changes, if proposer fails to identify changes, please indicate best estimate of potential changes)* | | | | | |
| 5. 3. 4. 1. For each Imbalance Pricing Period, φ, the Market Operator shall calculate the Marginal Energy Action Price (PMEAφ) as follows:     where:   * + - * 1. QNIVφ is the Net Imbalance Volume Quantity;         2. PBOukφ is the Bid Offer Price for Generator Unit, u, and rank, k;         3. FIPukφ is the Imbalance Price Flag for Generator Unit, u, and rank, k;         4. PCAP is the Market Price Cap; and         5. PFLOOR is the Market Price Floor. | | | | | |
| **Modification Proposal Justification**  *(Clearly state the reason for the Modification)* | | | | | |
| First part:   * While theoretically there should be no situation where there is not at least one unflagged action, there may be situations which arise in reality where the quantity of the marginal action is below the De Minimis Acceptance Threshold (DMAT), which means that it would be excluded from the ranked set used in the remaining Imbalance Pricing calculations, giving rise to this scenario where all actions in the ranked set are flagged; * Applying the rules as they are in this situation would mean that if this arises in any five minute period the price should default to the Market Back Up Price (PMBU) for the whole half hour, as there is no provision for the situation and therefore application of the pricing rules has “failed”; * However what is proposed to be a more theoretically sound approach in this situation would be to set PMEA = PCAP when QNIV is positive, or PMEA = PFLOOR when QNIV is negative. What this means is that the pricing approach can continue, the PRBO process will ensure that this PMEA does not actually influence the final Imbalance Price (all actions will revert to their own PBO for the remainder of the Imbalance Price calculations), and a pure NIV Tagging approach will apply with those prices. This will happen in all situations based on the logic of creating PMEA and PRBO:   + When QNIV is positive, PMEA is the maximum PBO of unflagged actions, or as per this proposal PCAP if there are no unflagged actions, and PRBO is the minimum of PMEA and PBO. Since the offer price of all actions is required to be less than or equal to PCAP this means that PMEA at PCAP will not continue through the rest of the calculations unless there is actually an action taken on a unit which offered at PCAP;   + When QNIV is negative, PMEA is the minimum PBO of unflagged actions, or as per this proposal PFLOOR if there are no unflagged actions, and PRBO is the maximum of PMEA and PBO. Since the bid price of all actions would is required to be greater than or equal to PFLOOR this means that PMEA at PFLOOR will not continue through the rest of the calculations unless there is actually an action taken on a unit which bid at PFLOOR. * This would mean that the Imbalance Price is based on the prices of balancing actions in these situations under a NIV Tagging approach, rather than based on ex-ante market prices under a Market Back Up Price approach, which would also lose the information of the cost of balancing in other five minute Imbalance Pricing Periods within the half hour Imbalance Settlement Period where this situation did not occur as setting PIMB to PMBU is a half hourly occurrence, rather than a five minute occurrence. This change would create an outcome for the Imbalance Price which is closer to the true cost of balancing energy in these scenarios; * Also, theoretically it would make sense to say that if all actions were indeed flagged, then there is insufficient information from the flagging process to accurately tell what actions are energy vs non-energy, and so in those situations we should apply the NIV Tagging approach to find the energy actions, assuming that the most expensive actions are the non-energy actions. This is what is done in all other situations for mismatched flagged quantities versus the NIV, so it would be just extending it to a further situation where all actions are flagged; * PMEA is not used in any other area of the Code other than the creation of PRBO and being published, so the setting of it to PCAP or PFLOOR cannot proliferate through any other aspect of the market; * Numerical examples of the outcomes with the proposal are provided as appendices at the end of this document, Appendix 1 gives an example of a positive QNIV situation, and Appendix 2 gives an example of a negative QNIV situation.   Second part:   * As written it looks like PMEA is only set to Max or Min (PBO over all PBO) if FIP =1, which is illogical as it will simply set PMEA to the maximum Bid Offer Price. The intended outcome from a design perspective is clear, which is to take the marginal (max or min) price of all unflagged actions, and this change is to clarify the text to ensure there is no ambiguity. | | | | | |
| **Code Objectives Furthered**  *(State the Code Objectives the Proposal furthers, see Section 1.3 of T&SC for Code Objectives)* | | | | | |
| * to provide transparency in the operation of the Single Electricity Market; * to facilitate the efficient, economic and coordinated operation, administration and development of the Single Electricity Market in a financially secure manner;   In particular this modification allows for the Imbalance Price to better reflect the true economic costs of the balancing market in a given situation which enhances efficiency, and in removing ambiguity in the rules it provides additional transparency. | | | | | |
| **Implication of not implementing the Modification Proposal**  *(State the possible outcomes should the Modification Proposal not be implemented)* | | | | | |
| * Additional instances of the imbalance price being the Market Back Up Price, which is less representative of the economic cost of balancing the system in the period where the scenarios discussed arise, while there is actually accurate information available to calculate such an economically representative price through the Bid Offer Prices of Accepted Offers and Bids through a pure NIV Tagging approach; * Potential requirement for change request or risk of non-compliance of Central Market Systems with the rules, as the systems are currently implementing the proposed approach; * Ambiguity of outcomes for calculating the Marginal Energy Action Price if reading the rules in isolation without knowledge of the design intent. | | | | | |
| **Working Group**  *(State if Working Group considered necessary to develop proposal)* | | | **Impacts**  *(Indicate the impacts on systems, resources, processes and/or procedures; also indicate impacts on any other Market Code such as Capacity Marker Code, Grid Code, Exchange Rules etc.)* | | |
| N/A | | | N/A | | |
| ***Please return this form to Secretariat by email to*** [*modifications@sem-o.com*](mailto:modifications@sem-o.com) | | | | | |

**Notes on completing Modification Proposal Form:**

1. **If a person submits a Modification Proposal on behalf of another person, that person who proposes the material of the change should be identified on the Modification Proposal Form as the Modification Proposal Originator.**
2. **Any person raising a Modification Proposal shall ensure that their proposal is clear and substantiated with the appropriate detail including the way in which it furthers the Code Objectives to enable it to be fully considered by the Modifications Committee.**
3. **Each Modification Proposal will include a draft text of the proposed Modification to the Code unless, if raising a Provisional Modification Proposal whereby legal drafting text is not imperative.**
4. **For the purposes of this Modification Proposal Form, the following terms shall have the following meanings:**

**Agreed Procedure(s): means the detailed procedures to be followed by Parties in performing their obligations and functions under the Code as listed in either Part A or Part B Appendix D “List of Agreed Procedures”. The Proposer will need to specify whether the Agreed Procedure to modify refers to Part A, Part B or both.**

**T&SC / Code: means the Trading and Settlement Code for the Single Electricity Market. The Proposer will also need to specify whether all Part A, Part B, Part C of the Code or a subset of these, are affected by the proposed Modification;**

**Modification Proposal: means the proposal to modify the Code as set out in the attached form**

**Derivative Work: means any text or work which incorporates or contains all or part of the Modification Proposal or any adaptation, abridgement, expansion or other modification of the Modification Proposal**

**The terms “Market Operator”, “Modifications Committee” and “Regulatory Authorities” shall have the meanings assigned to those terms in the Code.**

**In consideration for the right to submit, and have the Modification Proposal assessed in accordance with the terms of Section 2 of Part A or Chapter B of Part B of the Code (and Part A Agreed Procedure 12 or Part B Agreed Procedure 12) , which I have read and understand, I agree as follows:**

**1. I hereby grant a worldwide, perpetual, royalty-free, non-exclusive licence:**

* 1. **to the Market Operator and the Regulatory Authorities to publish and/or distribute the Modification Proposal for free and unrestricted access;**
  2. **to the Regulatory Authorities, the Modifications Committee and each member of the Modifications Committee to amend, adapt, combine, abridge, expand or otherwise modify the Modification Proposal at their sole discretion for the purpose of developing the Modification Proposal in accordance with the Code;**
  3. **to the Market Operator and the Regulatory Authorities to incorporate the Modification Proposal into the Code;**

**1.4 to all Parties to the Code and the Regulatory Authorities to use, reproduce and distribute the Modification Proposal, whether as part of the Code or otherwise, for any purpose arising out of or in connection with the Code.**

**2. The licences set out in clause 1 shall equally apply to any Derivative Works.**

**3. I hereby waive in favour of the Parties to the Code and the Regulatory Authorities any and all moral rights I may have arising out of or in connection with the Modification Proposal or any Derivative Works.**

**4. I hereby warrant that, except where expressly indicated otherwise, I am the owner of the copyright and any other intellectual property and proprietary rights in the Modification Proposal and, where not the owner, I have the requisite permissions to grant the rights set out in this form.**

**5. I hereby acknowledge that the Modification Proposal may be rejected by the Modifications Committee and/or the Regulatory Authorities and that there is no guarantee that my Modification Proposal will be incorporated into the Code.**

Appendix 1: Example of result with proposal for positive QNIV:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Resource Name | Rank | Order ID | Band | Start Time | End Time | Bid Offer Price (PBO) | Bid Offer Acceptance Quantity (QBOA) | System Operator Flag (FSO) | Non Marginal Flag (FNM) | Imbalance Price Flag (FIP) | Marginal Energy Action Price (PMEA) | Replacement Bid Offer Price (PRBO) | Net Imbalance Volume Tag (TNIV) | Price Average Reference Tag (TPAR) | Imbalance Price Tag (TIP) | Initial Imbalance Price (PIIMB) |
| GU\_1 | 1 | 2 | 2 | 00:40 | 00:45 | 25.96 | -1.408 | 1 | 0 | 0 | 10000 | 25.96 | 0 | 0 | 0 | 26.94 |
| GU\_2 | 2 | 1 | 1 | 00:40 | 00:45 | 10 | 1.875 | 0 | 0 | 0 | 10000 | 10 | 1 | 0 | 0 |  |
| GU\_3 | 3 | 2 | 1 | 00:40 | 00:45 | 16 | 0.8 | 1 | 0 | 0 | 10000 | 16 | 1 | 0 | 0 |  |
| GU\_4 | 4 | 1 | 1 | 00:40 | 00:45 | 17.83 | 13.875 | 1 | 0 | 0 | 10000 | 17.83 | 1 | 0 | 0 |  |
| GU\_4 | 5 | 2 | 1 | 00:40 | 00:45 | 17.83 | 1.542 | 1 | 0 | 0 | 10000 | 17.83 | 1 | 0 | 0 |  |
| GU\_5 | 6 | 2 | 6 | 00:40 | 00:45 | 22.77 | 0.768 | 0 | 0 | 0 | 10000 | 22.77 | 1 | 0 | 0 |  |
| GU\_5 | 7 | 2 | 7 | 00:40 | 00:45 | 23.31 | 1 | 0 | 0 | 0 | 10000 | 23.31 | 1 | 0 | 0 |  |
| GU\_5 | 8 | 2 | 8 | 00:40 | 00:45 | 23.79 | 0.6 | 0 | 0 | 0 | 10000 | 23.79 | 1 | 0 | 0 |  |
| GU\_1 | 9 | 1 | 1 | 00:40 | 00:45 | 24.94 | 14.25 | 1 | 0 | 0 | 10000 | 24.94 | 1 | 0 | 0 |  |
| GU\_6 | 10 | 1 | 1 | 00:40 | 00:45 | 25.1 | 8.625 | 0 | 0 | 0 | 10000 | 25.1 | 1 | 0 | 0 |  |
| GU\_6 | 11 | 2 | 1 | 00:40 | 00:45 | 25.1 | 2.292 | 0 | 0 | 0 | 10000 | 25.1 | 1 | 0 | 0 |  |
| GU\_7 | 12 | 1 | 1 | 00:40 | 00:45 | 25.12 | 3.042 | 0 | 0 | 0 | 10000 | 25.12 | 1 | 0 | 0 |  |
| GU\_7 | 13 | 2 | 1 | 00:40 | 00:45 | 25.12 | 2.292 | 0 | 0 | 0 | 10000 | 25.12 | 1 | 0 | 0 |  |
| GU\_4 | 14 | 2 | 2 | 00:40 | 00:45 | 25.99 | 4.522 | 1 | 0 | 0 | 10000 | 25.99 | 1 | 0 | 0 |  |
| GU\_4 | 15 | 1 | 2 | 00:40 | 00:45 | 25.99 | 13.311 | 1 | 0 | 0 | 10000 | 25.99 | 1 | 0 | 0 |  |
| GU\_4 | 16 | 2 | 3 | 00:40 | 00:45 | 26.1 | 1.725 | 1 | 0 | 0 | 10000 | 26.1 | 1 | 0 | 0 |  |
| GU\_8 | 17 | 1 | 1 | 00:40 | 00:45 | 26.94 | 6.054 | 0 | 0 | 0 | 10000 | 26.94 | 1 | 0.17 | 0.17 |  |
| GU\_1 | 18 | 1 | 2 | 00:40 | 00:45 | 28.84 | 1.408 | 1 | 0 | 0 | 10000 | 28.84 | 0 | 0 | 0 |  |
| How determined in plain English: | Order of price of decs first, then incs | From QBOA | From Unit via QBOA | From QBOA | From QBOA | From Unit via QBOA | From QBOA | From RTD | From RTD | FSO x FNM | Max(PBO with FIP = 1) or PCAP | Min(PMEA, PBO) | Tag all actions in opposite direction to NIV, tag that same volume of actions in the same direction as NIV starting from the marginal edge | Based on QPAR = 1, what 1MWh of all actions are closest to margin. | TNIV x TPAR | Average of TIP x PRBO, assuming no administered scarcity pricing this becomes PIMB |

Appendix 2: Example of result with proposal for Negative QNIV:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Resource Name | Rank | Order ID | Band | Start Time | End Time | Bid Offer Price (PBO) | Bid Offer Acceptance Quantity (QBOA) | System Operator Flag (FSO) | Non Marginal Flag (FNM) | Imbalance Price Flag (FIP) | Marginal Energy Action Price (PMEA) | Replacement Bid Offer Price (PRBO) | Net Imbalance Volume Tag (TNIV) | Price Average Reference Tag (TPAR) | Imbalance Price Tag (TIP) | Initial Imbalance Price (PIIMB) |
| GU\_1 | 1 | 1 | 1 | 07:40 | 07:40 | 17.56 | -2.167 | 0 | 0 | 0 | -1000 | 17.56 | 1 | 0.46 | 0.46 | 17.56 |
| GU\_2 | 2 | 2 | 1 | 07:40 | 07:40 | 18.25 | -4.937 | 1 | 0 | 0 | -1000 | 18.25 | 1 | 0 | 0 |  |
| GU\_2 | 3 | 1 | 1 | 07:40 | 07:40 | 18.25 | -11.98 | 1 | 0 | 0 | -1000 | 18.25 | 1 | 0 | 0 |  |
| GU\_3 | 4 | 1 | 1 | 07:40 | 07:40 | 23.44 | -5.406 | 1 | 0 | 0 | -1000 | 23.44 | 1 | 0 | 0 |  |
| GU\_3 | 5 | 2 | 1 | 07:40 | 07:40 | 23.44 | -1.927 | 1 | 0 | 0 | -1000 | 23.44 | 1 | 0 | 0 |  |
| GU\_4 | 6 | 2 | 1 | 07:40 | 07:40 | 24.04 | -15.208 | 1 | 0 | 0 | -1000 | 24.04 | 1 | 0 | 0 |  |
| GU\_4 | 7 | 1 | 1 | 07:40 | 07:40 | 24.04 | -1.458 | 1 | 0 | 0 | -1000 | 24.04 | 1 | 0 | 0 |  |
| GU\_2 | 8 | 2 | 2 | 07:40 | 07:40 | 24.13 | -0.975 | 1 | 0 | 0 | -1000 | 24.13 | 1 | 0 | 0 |  |
| GU\_2 | 9 | 1 | 2 | 07:40 | 07:40 | 24.13 | -8.775 | 1 | 0 | 0 | -1000 | 24.13 | 1 | 0 | 0 |  |
| GU\_2 | 10 | 1 | 3 | 07:40 | 07:40 | 25.09 | -8.025 | 1 | 0 | 0 | -1000 | 25.09 | 1 | 0 | 0 |  |
| GU\_2 | 11 | 2 | 3 | 07:40 | 07:40 | 25.09 | -0.892 | 1 | 0 | 0 | -1000 | 25.09 | 1 | 0 | 0 |  |
| GU\_4 | 12 | 1 | 2 | 07:40 | 07:40 | 26.53 | -1.542 | 1 | 0 | 0 | -1000 | 26.53 | 1 | 0 | 0 |  |
| GU\_4 | 13 | 2 | 2 | 07:40 | 07:40 | 26.53 | -13.875 | 1 | 0 | 0 | -1000 | 26.53 | 1 | 0 | 0 |  |
| GU\_3 | 14 | 1 | 2 | 07:40 | 07:40 | 48.78 | -0.9 | 1 | 0 | 0 | -1000 | 48.78 | 1 | 0 | 0 |  |
| GU\_5 | 15 | 1 | 1 | 07:40 | 07:40 | 70 | -16.134 | 1 | 0 | 0 | -1000 | 70 | 1 | 0 | 0 |  |
| GU\_5 | 16 | 1 | 2 | 07:40 | 07:40 | 80 | -7.5 | 1 | 0 | 0 | -1000 | 80 | 1 | 0 | 0 |  |
| How determined in plain English: | Order of price of decs first, then incs | From QBOA | From Unit via QBOA | From QBOA | From QBOA | From Unit via QBOA | From QBOA | From RTD | From RTD | FSO x FNM | Min(PBO with FIP = 1) or PFLOOR | Max(PMEA, PBO) | Tag all actions in opposite direction to NIV, tag that same volume of actions in the same direction as NIV starting from the marginal edge | Based on QPAR = 1, what 1MWh of all actions are closest to margin. | TNIV x TPAR | Average of TIP x PRBO, assuming no administered scarcity pricing this becomes PIMB |