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To:	All members and other interested parties
Ref:	23/168
Classification:	Trading	Consultation
Date:	14 September 2023
Subject:	**DECISION NOTICE ON PROPOSALS RELATING TO THE LME CLOSING PRICE METHODOLOGY**

Summary

1. This Notice (the "**Decision Notice**") sets out the LME's decisions in relation to the matters consulted on in LME Notice 23/091 (the "**Consultation**"). This includes the decision to apply the new Closing Price Methodology using additional VWAPs ("**Additional VWAP Closing Price Methodology**") for aluminium, copper, lead, nickel and zinc, subject to certain amendments, and update the Last Price methodology in the form set out in the Consultation.

Background

2. As outlined in the Action Plan to Strengthen the LME Group's Markets (the "**Action Plan**"), the proposed evolution of the LME Closing Price methodology is designed to bring greater transparency to the price discovery process, incorporate more determinism and ensure Closing Prices most accurately reflect prevailing prices at the end of the trading day. The proposal aims to bring the LME's methodology further in line with the industry standard and ensure that it encourages trading practices that will improve liquidity throughout the pricing windows.

3. The Consultation proposed that the LME adopt the Additional VWAP Closing Price Methodology to determine Closing Prices for a number of liquid prompts at the front of the curve in certain metals. This covers Cash, 3-month and the first four third-Wednesday monthly contracts in aluminium, copper, lead, nickel and zinc. It also proposed an amendment to the existing Last Price methodology and new timings for when each metal's Closing Price is established (together the "**Consultation Proposals**").

4. The LME received 29 responses to the Consultation and is grateful for the comments received. The LME has considered the responses carefully in reaching the decisions set out in this Decision Notice.

5. This Decision Notice summarises the responses the LME received in respect of the Consultation and sets out the LME's decisions in relation to the Consultation Proposals. Where appropriate, the relevant Benchmark Methodologies and Benchmark Statement shall be updated on the LME website prior to any change to the Closing Price methodology for any contracts.

6. This Decision Notice is split into three parts with additional detail in the appendices:

    (a)   Section A – Additional VWAP Closing Price Methodology

    (b)   Section B – Last Price methodology change

    (c)   Section C – Timeline for implementation of changes

7. Appendix 1 to this Decision Notice summarises the responses received to each question and restates the LME decisions where relevant. It presents the feedback received for each consultation question as

per the respondent's own classification. In some areas respondents provided additional information not directly relating to the respective question, as such some information may be repeated.

8. Appendix 2 to this Decision Notice is an updated Additional VWAP Closing Price methodology blueprint ("**Pricing Blueprint**"), which reflects the decisions summarised in this notice. The Pricing Blueprint provides additional detail on how the Additional VWAP Closing Price Methodology works, including examples to illustrate the calculation.

Defined terms

9. Defined terms in this Decision Notice shall have the meaning set out in the Consultation Notice 23/091 and the Decision Notice unless stated otherwise.

Section A) Additional VWAP Closing Price Methodology

Additional VWAP Closing Price Methodology

10. The LME has carefully considered all the feedback received, in combination with its intentions regarding the Additional VWAP Closing Price Methodology as laid out in the Consultation. These were to evolve the Closing Price methodology to a more deterministic industry standard methodology and to ensure Closing Prices most accurately reflect prevailing prices at the end of the trading day, and to encourage trading practices that will improve liquidity for participants throughout the pricing window.

11. The feedback received included a range of views on whether the LME should expand the use of VWAPs in the Closing Price Methodology. The feedback broadly aligned to the views previously represented by the CPWG[1] and summarised in Appendix 1 of the Consultation. The decisions outlined in this Notice take account of views from market participants and the wider population of users of the LME's prices, and represent what the LME believes to be the appropriate way to evolve the Closing Price methodology and continue to act in the best interests of the market as a whole.

12. The LME received some feedback regarding the impact on some Members' ability to offer guaranteed Closing Price orders (for multiple reasons, including the fact that unsatisfied bids and offers would have diminished influence), which could impact some participants' business models. In this regard, the LME is of the view that the Additional VWAP Closing Price Methodology provides a more deterministic calculation, more representative prices and encourages liquidity throughout the pricing window. As outlined in the Consultation, the Additional VWAP Closing Price Methodology focuses on a set of liquid instruments, which the LME deems appropriate to consistently price using VWAPs and TWAPs.

13. The LME has decided to implement the Additional VWAP Closing Price Methodology largely in the form set out in the Consultation. In order to take account of feedback received, the LME is implementing the Additional VWAP Closing Price Methodology with amendments in certain specific areas. These areas are the MVRs, rounding and the implementation timeline, which are all described below in more detail. Where appropriate, the Benchmark Methodology and Benchmark Statement for the Closing Prices will be updated in due course prior to go-live of the new methodology.

Changes to pricing window timings

14. As part of the Consultation, the LME proposed to change the timings of when each metal closes (and the resulting VWAP time windows). A full breakdown of the timings (for all base metals) can be found in Appendix 2.

15. The majority of respondents were in favour of the new proposed timings. The LME has therefore decided to proceed with the change as outlined in the Consultation.

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[1] Closing Price Working Group ("**CPWG**"), see LME Notice 21/135.

Rounding

16. The majority of feedback received from respondents suggested that rounding to anything less granular than $0.01 would create unpredictability for those trying to achieve the Closing Prices during the VWAP pricing window.

17. The LME has considered this feedback and is therefore amending the rounding in the methodology to $0.01 for all prompts other than the 3-month (see Appendix 2), for all metals.

18. For the avoidance of doubt, the LME reserves the right to amend the level of rounding, at its sole discretion, and will endeavour to provide reasonable notice of any such change to the market.

Minimum volume requirements

19. The Consultation proposed Minimum Volume Requirements ("**MVRs**") of 1 lot for all base metals (regardless of whether they are part of the Additional VWAP Closing Price Methodology or not). The feedback received from a number of respondents outlined concerns, particularly in scenarios where a single lot trades early in the pricing window and then the market moves later in the window but nothing has traded. The LME is of the view that there is a balance between ensuring traded volume is appropriately prioritised and avoiding potential negative scenarios as described above.

20. The LME has therefore decided to revise the MVRs to 5 lots for all metals and prompts that use VWAPs.[2]

21. For the avoidance of doubt, the LME reserves the right to amend the level of MVRs, at its sole discretion, and will endeavour to provide reasonable notice of any such change to the market.

Implementation approach

22. A number of respondents raised concerns with the implementation timeline for the Additional VWAP Closing Price Methodology, with some proposing a trial for a small number of metals or prompt dates. The LME believes that a trial could demotivate members from investing in any required preparation for the change and is unlikely to be a realistic assessment of the Additional VWAP Closing Price Methodology. However, the LME has taken into consideration the feedback from some respondents that a phased implementation would support market participants in preparing for the change.

23. The LME will therefore implement the new Additional VWAP Closing Price Methodology for two metals initially (aluminium and lead) in January 2024, followed by the remaining three (copper, zinc and nickel) in March 2024, to support Member readiness (more detail can be found in paragraphs 34 to 36). For the avoidance of doubt, this is a phased implementation and there is no further decision required in order to proceed with the remaining metals in March 2024.

Other areas of feedback

24. A small number of respondents suggested the Additional VWAP Closing Price Methodology could lead to less orderly pricing, particularly in times of stress. The LME believes that because the Additional VWAP Closing Price Methodology encourages liquidity throughout the pricing window, it is less likely to lead to – or exacerbate any – price distortions in times of stress. It is important that the LME continues to enhance and modernise its processes to ensure they remain as robust as possible.

25. A number of respondents suggested that the LME should implement additional technological enhancements, in particular "chaining" which refers to implied orders being used to further imply additional orders in other instruments. The LME has considered the feedback, and while it does agree chaining could provide some benefits to the market, the Exchange does not believe that chaining is a necessary enabler for the Additional VWAP Closing Price Methodology. The LME views that the primary value of chaining relating to pricing methodologies would be to remove available arbitrages between instruments, but the LME does not believe such arbitrages are a significant problem in LME markets. The LME also notes that due to the complexity of the LME date structure such functionality could generate a significant volume of orders which could have other negative impacts on the market.

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[2] The MVRs for non-anchor prompts consider all the volume from the spreads that contribute to pricing each prompt (where multiple spreads contribute to the valuation, further detail in Appendix 2).

26. Some respondents raised concerns around the potential fees involved in trading multiple spreads in order to achieve the Closing Price valuation. The LME believes the Additional VWAP Closing Price Methodology will allow trades to deterministically contribute towards the valuation, proportionate to their volume in line with the methodologies implemented by other exchanges. There is no obligation to trade multiple spreads, however the LME accepts that it may take time for market participants to adjust their trading practices and business models.

27. Some respondents also noted the complexity of having two methodologies, the LME takes note of these concerns. As described in the Consultation, daily dates and all other prompts will continue to be priced using the Last Price methodology. The LME highlights that the Additional VWAP Closing Price Methodology is being rolled out for the most liquid prompts, to avoid any potential challenges where illiquid instruments cannot be consistently priced, which aligns with approaches taken by peer venues.

28. Although not specifically asked in the Consultation, the LME has received a considerable amount of feedback about the introduction of additional Trade-at-Settlement ("**TAS**") contracts to support the Closing Price process. The LME has considered the feedback, and it does not view TAS as a necessary prerequisite for evolving the Additional VWAP Closing Price Methodology. That said, as stated in the outcomes of the Discussion Paper 2021 (Notice 21/111) the LME does intend to roll out TAS on additional 3-month contracts. This is currently intended to be implemented when LMEselect v10 goes live.

29. It was suggested by one respondent that the LME outlines its plan for the rest of the curve. As part of the proposal, the LME has focused the initial enhancements on the liquid prompts at the front of the curve. The LME takes note of the point and will continue to monitor and assess the liquidity in all metals and prompts, and where appropriate may look to expand the number of metals and/or prompts covered by the Additional VWAP Closing Prices Methodology (consulting as appropriate). More broadly, the LME will continue to consider additional enhancements to the methodology for all other prompts and welcomes views from the market in this regard.

30. For a more detailed summary of the responses to the individual consultation questions, please see Appendix 1.

Section B – Last Price methodology change

31. As set out in paragraph 15 of the Consultation, the LME proposed to amend the Last Price methodology such that, where an instrument does not have any orders in LMEselect in the window 5 minutes prior to the start of the Pricing Period, any subsequent orders during the Pricing Period in that instrument which create pricing conflicts may have a lower priority for consideration.

32. The majority of respondents were supportive of this change, and felt it would encourage participants to enter orders prior to the Pricing Window, which is beneficial for overall liquidity.

33. The LME has therefore decided to proceed with the change as outlined in the Consultation, to go live in January 2024 when the phased implementation begins.

Section C – Timeline for implementation of changes

Additional VWAP Closing Price Methodology

34. The LME intends to go-live with the Additional VWAP Closing Price Methodology for aluminium and lead on 22 January 2024, and then roll out the methodology for copper, zinc & nickel on 18 March 2024. Any change to these timelines will be communication via Notice in due course.

35. The LME intends to make the change to the pricing window timings and the change to MVRs on 22 January 2024, when the phased implementation of the new methodology begins.

36. The LME will make available VWAP model prices for the additional prompts that will be determined using the VWAP Methodology, on a daily basis on the LME website for a period of two months prior to implementing the VWAP methodology for each metal.

Last Price methodology change

37. The LME intends to go-live with the change to the Last Price methodology on 22 January 2024, any change to these timelines will be communication via Notice in due course.

Queries

38. Should any market participants have any questions in relation to this Decision Notice, or requests for further clarification, please contact rm@lme.com.

Jamie Turner

Interim Chief Operating Officer, LME

cc: Board directors

      All committees

Appendix 1 – Summary of feedback received per question

Q1: Do you agree with the LME's identified key factors related to the Closing Price methodology?

Summary of feedback received

1. Most respondents agreed with the key factors related to the Closing Price methodology as laid out in the Consultation, and a variety of views were expressed including:

   a) The provision of guaranteed Closing Price orders offered by various banks and brokers is important for users of the LME market.
   b) The proposed factors will modernise the pricing process, bring the LME in line with global peers, and encourage liquidity.
   c) Increased representativeness of pricing by allowing a maximum number of users to participate and contribute to the liquidity during the price discovery process.
   d) The resilience of LME users, noting the Ring closure during 2020/2021 period where a representative number of Members offered guaranteed prices.
   e) Members who find the technological changes a challenge might be the ones susceptible to reduced participation.
   f) The introduction of additional TAS functionality would help Members reduce hedging errors and offer clients increased user choice.

2. A small number of respondents had strong views against the statement laid out in paragraph 6 of the Consultation, "that Ring-determined Official prices continue to be best suited to the specific requirements of physical market participants". They suggested the proposal was out of line with other major modern commodity futures exchanges, and questioned its alignment with regulatory guidance on best execution and client protection. They added this created a barrier to entry by limiting final price determination to a small number of Ring Dealing Members, and also reduced transparency as final price determination was not visible to all participants. Hence, this could create conditions that can lead to price distortions, which would eventually reduce confidence in the LME's market structure and discourage liquidity and participation from clients and other Members.

3. Additionally, a number of respondents expressed concerns on the overall proposal, including:

   a) The potential negative unintended consequences of changing from a well-established Last Price methodology, which takes into consideration the expert judgement of experienced, knowledgeable, exchange staff, and moves purely to an arithmetic formula.

   b) The lack of a native functionality to track the VWAP process in LMEselect, which could require infrastructure investment by Members if they want to participate in an informed capacity.

   c) Rather than improve transparency and broaden participation, the result could be a lack of liquidity and the changes could be detrimental to the liquidity, reliability, stability and overall orderliness of the LME market.

   d) The possibility of unreflective prices during illiquid and volatile conditions, which will deter Members from guaranteeing prices.

   e) Brokers' inability to guarantee the Closing Price to clients could lead to higher costs and associated fees.

   f) The LME's unique prompt date structure would benefit electronic trading styles rather than the "physical" market players, which could mean a messy close with limited participation from physical market players;

   g) The need for Chaining, which would increase user confidence in the system both for Closing Prices and outside of the pricing windows and prevent volumes moving to other trading venues.

h) The removal of iceberg orders would populate LMEselect with increased visible volume, so not only benefit the minority which have the ability to enter iceberg orders.

i) The LME should consider the risks of unfulfilled volumes and rogue bids/offers that may distort the VWAP.

j) In a physically settled, low stock environment, there could be a lack of participation from algorithms at the front of the curve and a potential for market gaps. The unintended consequence would be that liquidity providers would have greater pricing risk in guaranteeing the close, which could be problematic for financial institutions whose models are mandated to achieve the Closing Price.

k) The LME's attempt to mirror other exchanges was not achievable given the date complexity and the periods of spread illiquidity.

l) The resistance from liquidity providers to guarantee broken dated settlements given the Additional VWAP Closing Price Methodology will always take precedent. These broken dated rates are of high importance for the physical market as they can make a significant difference to the pricing against the Averaging Asian options and the settlement of bespoke physical deals.

The LME's decision

4. The LME has taken into consideration the feedback received, and is confident the Additional VWAP Closing Price Methodology represents an appropriate path forwards to evolve the Closing Price methodology and continue to act in the best interests of the market as a whole.

Q2: In light of those factors, do you agree with the LME's proposed path of travel to evolve the Closing Price methodology to expand the use of deterministic calculation methodologies based on VWAPs?

Summary of feedback received

5. In general, respondents were supportive of the LME's approach, as described in the Consultation, but expressed some reservations about certain details within the methodology. The Consultation was described by a number of respondents as enhancing transparency, participation, liquidity and aligning with modern industry standards.

A number of comments concerning the approach were however received, including:

a) Closing Prices should reflect the market conditions at the time of the market close, and the VWAP is not representative of the closing conditions.

b) The complexity surrounding the use of both methodologies as per the proposal, which might deter users, and it was hence suggested to start with a trial period on one metal.

c) The increase in trading costs that will be passed on to clients, and decrease volumes traded and discourage market participation in the long run.

d) Suggestions to phase out the Last Price methodology, and have a plan that moves away for the rest-of-curve methodology that moves away from expert judgement, as that would improve price fairness and transparency.

e) The introduction of electronic matching functionality such as TAS across both outright contracts and liquid carries to modernise and increase user choice, to be made available at the same time as the Additional VWAP Closing Price Methodology.

6. A number of issues concerning the overall Consultation Proposals, although not directly related to the question, were also raised, including:

a) The proposed methodology is susceptible to being affected by one large trade, adding that pricing may be prone to manipulation and that "by moving to a VWAP Methodology the LME risks non-compliance with its regulatory obligations". The LME has considered this feedback and believes its current systems and controls to detect potential manipulation and ensure prices are determined in

an appropriate manner will continue to operate adequately. This will allow the LME to implement the proposed methodology whilst continuing to meet its regulatory obligations.

    b) If there is insufficient volume to fulfil orders on the close, such that the last shown bid/offer is some distance from the VWAP, Members will not be able to guarantee the close, which would be detrimental to liquidity. Hence, it was suggested the LME need to remain available to intervene where required such that the Closing Prices do not differ significantly from where the last interests shown were.

    c) The LME was advised against rounding the prices as it prevents the exact price from being guaranteed.

    d) More technological advances such as Chaining are required.

    e) VWAP could lead to poor price discovery in periods of stress and low market liquidity. Further, Members will be concerned that they can only execute partial tonnage on orders and that subsequent bids and offers which do not result in trades will not be treated as relevant to the price discovery.

7. It was suggested the LME promote a methodology that incentivises Members to take orders in times of market stress, allowing market participants to reduce risk positions where they need to, by allowing bids and offers to become relevant to price discovery. Further, some respondents argued the current system is highly effective and should not be replaced by a new methodology.

8. It was suggested the LME reconsider the timeline for the changes, as it will create unknown risk, unintended consequences, and ramifications to the orderly functioning of the market.

9. One respondent suggested the LME should reduce fees for trading within the Closing Period to negate some of the increased costs, or introduce some other incentives.

10. It was suggested a variety of options should be considered before implementing the Proposal, such as Electronic Last Trade, Open Outcry Last Trade, VWAP, auction, midpoint of last market; and select the most appropriate option or a hybrid. It was also argued that the Closing Prices should be derived from VWAPs on outright 3rd Wednesday contracts rather than spreads, provided the LME also delivers Chaining to ensure all liquidity sources are being utilised.

The LME's decision

11. In general, given the feedback received from respondents, the LME believes the Additional VWAP Prices Methodology as laid out in the Consultation Proposals, is an appropriate way forward to evolve the Closing Price methodology to a more deterministic industry standard methodology and to ensure Closing Prices most accurately reflect prevailing prices at the end of the trading day, and to encourage trading practices are in the best interests of the market of as a whole.

12. As noted above, with regards to the comments received on the technological challenges raised by some respondents, the LME is mindful of these concerns, and recognises that chaining can avoid some arbitragable opportunities on the curve. It also notes that due to the complexity of the LME date structure – such functionality could generate a significant volume of messages and does not solve all of the challenges that respondents raised. It also notes that in practice arbitrage opportunities very rarely occur on the LME market, and if they do then market participants generally step in and trade.

13. In relation to the feedback received on the impact on some Members' ability to offer guaranteed Closing Price orders (where unsatisfied bids and offers do not influence the valuations) the LME is of the view that – where there is sufficient liquidity – the new methodology provides a more deterministic calculation, more representative prices and encourages liquidity throughout the pricing window. As outlined in the Consultation, the Additional VWAP Closing Price Methodology focuses on a set of liquid instruments, which the LME deems appropriate to consistently price using VWAPs and TWAP calculations.

14. Some participants raised concerns around the potential fees involved in trading multiple spreads in order to achieve the Closing Price valuation. The LME believes the Additional VWAP Closing Price Methodology allow trades to deterministically contribute towards the valuation, proportionate to their volume in line with the methodologies implemented by other exchanges. There is no obligation to trade multiple spreads.

15. In relation to feedback received about poor price discovery in periods of stress, the LME is of the view that because the Additional VWAP Closing Price Methodology encourages liquidity throughout the pricing window, it is less likely to lead to – or exacerbate any – price distortions in times of stress.

16. The LME has decided to implement the proposal broadly as set out in the Consultation, with a number of specific changes in certain areas based on the feedback received.

Q3: Irrespective of your answer to Q1 or Q2, if the LME does move towards a more deterministic methodology based on VWAPs, do you agree that the proposed VWAP Methodology described in this document is the most appropriate one? If you believe there is a more appropriate model, please give full details.

Summary of feedback received

17. There was a range of views on whether the proposed methodology described is the most appropriate one for the LME market.

18. A number of suggestions on the detail of the methodology were raised:

    a) To extend the front-of-curve methodology to M5, which is relevant when approaching the expiry of M1, due to increase of activity in M5. Further, to enhance the Rest-of-Curve Methodology by using a theoretical price model (e.g. a linear interpolation model).

    b) The proposed methodology uses distinct VWAP windows for the 3-month outright and carries, while there is a need to trade electronically the implied combinations of the 3-month outright and the carries.

    c) Some respondents argued the Additional VWAP Closing Price Methodology should be tested out on one metal first, or to phase out the introduction of the methodology for M3-3M first, and then roll it out to the other metals and months. Further, appropriate notice must be given to the market to allow participants to gain confidence in the methodology.

    d) The LME should ignore trading activity that sweeps the order book late in the pricing window.

    e) The LME should eventually implement the Additional VWAP Closing Price Methodology on the whole curve. It was also noted there will exist a conflict between outright prices and spread implied prices when 3rd Wednesdays outrights volumes grow.

    f) The LME was advised to consider significant orders, even if these are not traded to obtain a more representative price. Similarly, it was suggested to consider TAS for 3rd Wednesday outrights prior to adopting the Consultation Proposals, citing the success of Nickel 3-month TAS.

    g) One respondent in particular suggested adjusting the position of M4 in the order of priorities for VWAP spread from #3 to #2, removing M2-M4 as a VWAP instrument for M4, adding it seems illogical to have M2-M4 contribute to the determination of M4 but have no influence on M2, and then adding M2-M4 to the VWAP instruments to M2 after M4 is known.

19. Many respondents reiterated their desire for Chaining to ensure that all outright 3rd Wednesday prices, and all spreads are taken into account, including cash spreads. Similarly, the introduction of smart order routing on electronic LME markets would ensure participants have the ability to access all liquidity available to them. One respondent further suggested the LME creates MOC prices through Chaining to create the price curve, which would incentivise market participants to input spread orders that would then create an outright price curve.

20. Many respondents reiterated that rounding creates a less accurate valuation of spreads, which makes the process less deterministic.

The LME's decision

21. The LME has carefully considered the feedback received, and believes the metals and prompts outlined in the Consultation represent an appropriate path forward. However it will continue to consider additional enhancements to the methodology for all other prompts and welcomes views from the market in this regard.

22. In regards to the feedback on the position of M4 in the pricing methodology, the LME has considered the response but is still of the view that it is appropriate to price M2 first. This ensures that the M2-M3 spread is as easy to target as possible. It should be noted that because M2-M4 is included in the M4 valuation, any participant who trades M2-M4 volume will have this proportionately reflected in the M2-M4 valuation.

23. In regards to the feedback suggesting the LME consider including monthly outright volume along with spread volume in the methodology, the LME does not believe it would be beneficial at this point as monthly 3rd Wednesday volumes remain low relative to volume in spreads. A number of participants have expressed their preference for separate outright and spread pricing windows (as per the proposal), given this it would be problematic to include monthly outright prices from the previous pricing window as prices may no longer be reflective.

24. The LME has considered the feedback in relation to TAS, and it does not view TAS as a necessary prerequisite for evolving the Closing Price methodology. That said, as stated in the outcomes of the Discussion Paper 2021 (Notice 21/111) the LME does intend to roll out TAS on additional 3-month contracts. This will be implemented when LMEselect v10 goes live, and has been addressed in paragraph 28 above.

25. In relation to feedback received about initially doing a "trial" for a small number of metals or prompt dates, the LME believes this could demotivate members from investing in any required preparation for the change and is unlikely to be a realistic assessment of the methodology. However, the LME has considered the feedback from some respondents that a phased implementation would support Members in preparing for the change. The LME will therefore implement the new Additional VWAP Closing Price methodology for two metals initially (aluminium and lead) in January 2024, followed by the remaining three (copper, zinc and nickel) in March 2024 to support Member readiness, and has been addressed in paragraph 22 and 23 above.

26. The LME has decided to implement the proposal broadly as set out in the Consultation, with a number of specific changes in certain areas (set out above in paragraphs 14-23) based on the feedback received.

Q4: Do you agree with the new timings proposed by the LME for determining each metal's Closing Price?

Summary of feedback received

27. The majority of respondents agreed with the new timings proposed, noting the reordering will help the LME in publishing the Closing Prices as soon as possible, and also helps clients place their orders in a timely fashion.

28. Some respondents noted it was a good idea to move zinc closer to the end of the day, but argued there could be problems with the congestion due to consecutive busy metals closing out without any natural breaks.

29. Further, it was suggested the 3-month VWAP Price is established in the first 5 minutes of the 10-minute windows so that the leg price for spreads is known. One respondent added nickel and lead's timings should be swapped so that lead is the first metal to price.

The LME's decision

30. The LME has considered the feedback received and remains of the view that the proposed sequencing of metals represents the appropriate path forwards, supporting clients in being able to enter orders and supporting the LME's operational processes.

Q6: When pricing additional prompts using the proposed VWAP methodology, do you think the LME should apply rounding? If you believe the LME should apply rounding, please detail what rounding should be applied

Summary of feedback received

31. Most respondents were against the LME's proposal to round prices, arguing it defeated the purpose of the VWAP methodology. They expressed concerns about the unnecessary risk that rounding to any

valuation would pose, when trying to execute during a VWAP. The majority of the respondents felt the prices should be rounded to the closest cent.

32. Some respondents raised concerns that rounding prices could lead to significant issues for Members, and potentially increase costs for clients. Additionally, the spread valuations on the close would lose accuracy, which would prevent members from guaranteeing prices to clients or lead to an increase in commissions.

33. Other respondents suggested that rounding could be easily amended, and had no objection to the proposal initially. A small number of respondents suggested rounding should be applied once all the VWAP calculation was complete, and not at each stage.

<u>The LME's decision</u>

34. The majority of feedback received suggested that rounding to anything less granular than $0.01 would create unpredictability for those trying to achieve the Closing Prices during the VWAP, and therefore disagreed with the rounding proposal in the Consultation. The LME has considered this feedback and is therefore adopting $0.01 rounding for all prompts (other than the 3-month anchor prompt), for all metals, to reflect the feedback received.

35. The changes to the rounding will be implemented in line with the roll out of the methodology in the form set out in the Consultation. As reiterated, to support Member readiness, the Additional VWAP Closing Price Methodology will be implemented first on two metals in January 2024, followed by the three remaining metals in March 2024.

Q7: For the 3-month prompt VWAP there are currently Minimum Volume Requirements ("MVRs") in place for all base metals (set out on the LME website),the LME is minded to reduce the MVRs to 1 for non the VWAP methodology metals?

<u>Summary of feedback received</u>

36. There was a range of views concerning the proposal, mostly negative, providing specific scenarios that could lead to less representative prices. Some respondents misunderstood the proposed Additional VWAP Closing Price Methodology, suggesting that where MVRs are not met, it reverts to the Last Price methodology. The Consultation instead makes clear that the price is determined using a TWAP methodology, as outlined in the Pricing Blueprint. That said, respondents were generally concerned about negative consequences of having very low MVRs.

37. Specific concerns were raised around the detail of the proposal:

    a) Unsatisfied volumes currently do not affect the existing methodology. Small trades can impact the valuation.

    b) It will be difficult to get a consensus of what the MVR should be, as it varies by contract, by metal and by what is considered a significant trade size. This would encourage increased algorithmic influence, which potentially distorts Closing Prices.

    c) Tin should be the only metal with a MVR of 1.

    d) The MVR for carries should be higher than 1, and metal dependent. Further, there will be knock on problems when high volume spreads, visible and for a period of time do not have an effect on the VWAP methodology for Closing Prices.

    e) One respondent in particular noted the MVR for aluminium should be 100 lots, alongside every minimum being metal-dependent.

    f) Large volumes with unexecuted orders will be ignored in favour of small executed volumes, which is less representative and can also lead to higher costs.

    g) The complexity of the prompt date structure implies there should naturally be some expert judgement to manage conflicts, and prevent spurious transactions to influence the Closing Price.

    h) MVR thresholds have a similar benefit to a TWAP by ensuring a significant level of liquidity, and hence provides greater credence to the price formation.

i) Low MVRs dismiss the higher volume bids that trade at a significantly different level to the traded volume.

38. One suggestion proposed applying a quantitative methodology to the MVR for each metal and each spread, whether using 20% of the average volume traded over time, or using a combination of percentage and observed period of time.

<u>The LME's decision</u>

39. The LME has carefully considered the feedback received on MVRs. The LME is of the view that there is a balance between ensuring traded volume is appropriately prioritised in the pricing process and avoiding negative scenarios as described above. There is also a balance between a granular per metal calibration and the simplicity of a universal MVR. The LME has therefore decided to revise the MVRs to 5 lots for all metals and prompts that use VWAPs[3]. The LME reserves the right to amend the level of MVRs, at its sole discretion, without further consultation, but will give reasonable notice of any such changes to the market.

Q8: Are there any potential wider market impacts of moving to the proposed Closing Price methodology that the LME should be aware of, for example on the pricing of related OTC contracts?

<u>Summary of feedback received</u>

40. The LME received a range of comments on the question, many of which have already been noted elsewhere and relate to topics for which the LME decision is outlined in the response to other questions above. Some respondents reinforced their support of the proposal, highlighting it will enhance the wider LME market by making price distortions less likely. One respondent argued that it would make the exchange more aligned peer venues.

41. Other respondents expressed concerns about the Additional VWAP Closing Price Methodology and its wider impacts on the market, namely:

a) Changes pose challenges and risks to certain business models.

b) There may be an impact on Members' ability to guarantee the closing price to clients, and to market liquidity.

c) The valuation of spreads within monthly spreads and the impact on average pricing.

d) Market conditions could cause a dislocation in closing price compared to trading activity during the VWAP window.

e) The OTC market that uses LME prices as a benchmark and the potential impact on disruption events, which could trigger an event in an OTC contract.

f) Implementation timeline concerns, in order to give Members time to adapt to technological changes.

g) Split methodology along the curve could cause confusion, and be detrimental to LME's unique prompt date structure.

h) The suggestion that CPWG members were against the idea.

42. Some respondents suggested making all VWAP Closing Prices known (via LMEselect) as soon as determined to allow the Closing Prices to be used for other products such as the LME options expiry process should the LME move towards cash-settled exercise process in the future. Many also suggested trialling the methodology on one metal to produce some data, with some respondents listing zinc as the best metal.

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[3] The MVRs for non-anchor prompts, consider all the volume from the spreads that contribute to pricing each prompt.

43. In relation to concerns about the general timeline of the proposal, which was set out in the Consultation, the LME's approach is to roll out the Additional VWAP Closing Price Methodology with a phased implementation, partially in January 2024 and partially in March 2024, in order to give market participants sufficient time to adapt to the changes. In relation to feedback received about holding a potential "trial", the LME believes it could demotivate members from investing in any required preparation for the change and is unlikely to be a realistic assessment.

44. In regards to the comments received on the technological challenges raised by some participants, the LME is mindful of these concerns, and recognises that the introduction of chaining may avoid arbitrageable opportunities on the curve, but such situations rarely occur and would not solve all the issues Members have with the methodology. The LME has addressed this feedback in paragraph 25 above.

45. While the LME understands the concerns raised about the trading fee increases, the LME believes the methodology will allow trades to deterministically contribute towards the valuation, in a proportionate manner to their volume, without any obligation to trade multiple legs. That said, the LME notes that in some cases, such as where a spread crosses the front and rest of curve, participants may have to execute component parts, but that the representativeness of pricing is paramount.

46. In regards to the comments received by some respondents about the complexity of having two methodologies, the LME takes note of these concerns. As described in the Consultation, daily dates and all other prompts will be continued to be priced using the Last Price methodology. The LME highlights the Additional VWAP Closing Price Methodology is being rolled out for the most liquid prompts to avoid any issues with illiquid instruments that cannot be consistently priced. As such, the LME believes that liquidity and sufficient volumes will persist, as was the case when rolling out the VWAP on 3-month.

Changes To Last Price Methodology

Background

47. As part of the Consultation, the LME also took the opportunity to consult on an amendment to the Last Price methodology (paragraph 15 of the Consultation). The LME proposed to amend the Last Price methodology such that, where an instrument does not have any orders in LMEselect, in the window 5 minutes prior to the start of the Pricing Period any subsequent orders during the Pricing Period in that instrument which create pricing conflicts may have a lower priority for consideration.

Q5: Do you agree that the LME should make the change to the Last Price methodology described in paragraph 15?

Summary of feedback received

48. Most respondents were in favour of the proposed changes described in paragraph 15 of the Consultation. It was highlighted that although the existing Last Price methodology works well, the change encourages traders to show an interest in a particular spread before the 5 minute window which gives other traders time to react and provide liquidity to that particular spread. One respondent requested some back testing to be done to reduce pricing conflict.

49. Other responses included:

    a) Further detail will be required on how pricing will work in practice, especially further out on the curve.

    b) The preference for the current methodology, which is well known, well accepted and transparent, suggesting the proposal is resource and cost intensive, and more complex. Scepticism is present given the recent events that precipitated large regulatory and non-regulatory requirements.

    c) Changes are resource intensive and increase complexity.

    d) Greater clarity as to the criteria used in formulating prices for the rest of curve.

50. The LME has carefully considered the feedback received and proposes to amend the Last Price methodology, such that, where an instrument does not have any orders in LMEselect, in the window 5 minutes prior to the start of the Pricing Period, any subsequent orders during the Pricing Period in that instrument which create pricing conflicts may have a lower priority for consideration.

51. In regards to comments received about the subjective interpretation the Last Price methodology change as described in paragraph 15 of the Consultation, the LME is of the view that it will instead promote deterministic pricing and promote a fair representation of prices. On this basis, the LME has decided to implement the methodology in the form set out in the Consultation.

Additional VWAP Closing Price methodology blueprint

1   Detailed explanation of the LME's proposed Closing Price pricing methodology

This document provides a detailed explanation of the Additional VWAP Closing Price Methodology, including detailed examples for the front-of-curve ("**FC**") methodology.

1.1   FC methodology

The FC methodology is a deterministic approach for pricing the liquid contracts at the front of LME forward curves. It is based on a volume-weighted-average-price ("**VWAP**") calculation of trades during defined pricing windows. The FC framework below has been written in a flexible manner, with the intention that it is scalable and could be applied to additional prompt dates in future if deemed appropriate. Initially it will apply to Cash, M1, M2, M3, M4 in addition to the existing 3-month VWAP for Copper, Aluminium, Nickel, Zinc and Lead. The approach to price the front of the curve is to:

1. Establish the 3-month price (anchor contract) using a VWAP calculation.
2. Then, in a defined order, price each third Wednesday monthly contract using the spreads[4] between that month and all other contracts that have already been priced. For example, 3M outright first, then establish M3 on the basis of the M3-3M spread, then establish M2 on the basis of both M2-3M and M2-M3 spreads etc.
3. Then price the Cash contract on the basis of the spread between cash and the nearest monthly contract, ie Cash-M1.

The 3-month and spread prices will be established over separate pricing windows for each metal (with the respective spread window immediately preceding the 3-month window) to allow for traders to separately focus on outright trading and spread trading. No outright trades for prompts other than 3-month will be included in the calculation as otherwise the outright prices for the monthly contracts may not align to the 3-month outright price (as they were taken from different pricing windows).

As part of the Additional VWAP Closing Price Methodology, if the volume of the contract being priced does not meet the minimum-volume-requirement (aggregating the input instruments) during the relevant pricing window, then a time-weighted-average-price ("**TWAP**") of a defined "indicator reference price" ("**IRP**") is used. This IRP reflects the last trade (or previous day's Closing Price if there are no trades), dragged higher or lower by a respective better bid or better offer (during the spread pricing window).[5] The IRP will use only one spread which will be the M3-3M spread when pricing M3, then for all other instruments it will be the spread from the instrument to the nearest already priced monthly instrument (e.g for M4 the IRP will use M3-M4, for M2 the IRP will use M2-M3).

The key parameters, and the detail of the calculation of the FC methodology is explained below. For detailed pricing examples please see section 2 of this document.

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[4] A calendar spread is often referred to as a "carry" on the LME market.

[5] The TWAP calculation is performed at a millisecond (ms) granularity. Where there are multiple bids, offers or trades in one ms, the TWAP calculation uses the last bid, offer or trade point for that discrete ms.

1.1.1 Parameters (FC methodology)

Anchor contracts:

Anchor point	Month
Primary:	**3-month (3M)**
Other:	*None*

Spread VWAP Contract order:

Ordering	Contract	VWAP Instruments	TWAP Instrument
1	3rd 3rd Wednesday (M3)	M3-3M	M3-3M
2	2nd 3rd Wednesday (M2)	M2-3M M2-M3	M2-M3
3	4th 3rd Wednesday (M4)	M2-M4 M3-M4 3M-M4	M3-M4
4	1st 3rd Wednesday (M1)	M1-M2 M1-M3 M1-3M M1-M4	M1-M2
5	Cash	Cash-M1	Cash-M1

The above table assumes that the 3Mm prompt date falls between M3 and M4 (which is the most common occurrence). Where this is not the case, the same instrument is used, but in its reversed form ie 3M-M3 or M4-3M.

Where the Cash contract is a 3rd Wednesday, then for the purpose of this calculation it will be priced as the Cash contract (with the next contract being M1).

Where the 3-month contract is a 3rd Wednesday, the ordering stays the same but the related "M" contract is already known at the relevant step in the pricing methodology.

Pricing windows:
VWAP Methodology Prompts

Metal	Anchor Pricing Window	Spread Pricing Window
Nickel	16:15:00:000 – 16:19:59:999	16:10:00:000 – 16:14:59:999
Aluminium	16:25:00:000 – 16:29:59:999	16:20:00:000 – 16:24:59:999
Zinc	16:35:00:000 – 16:39:59:999	16:30:00:000 – 16:34:59:999
Copper	16:45:00:000 – 16:49:59:999	16:40:00:000 – 16:44:59:999
Lead	16:55:00:000 – 16:59:59:999	16:50:00:000 – 16:54:59:999

Other non VWAP Methodology prompts[6]

Metal(s)	Anchor Pricing Window	Spread Pricing Window
Cobalt	15:50:00:000 – 15:54:59:999	15:50:00:000 – 15:54:59:999
Aluminium premiums, aluminium alloy and NASAAC	15:55:00:000 -- 15:59:59:999	15:55:00:000 – 15:59:59:999
Tin	16:05:00:000 – 16:09:59:999	16:00:00:000 – 16:04:59:999

Rounding:

	Anchor Contract	Spread VWAP Contract
Aluminium	$0.50/mt	$0.01/mt
Copper	$0.50/mt	$0.01/mt
Lead	$0.50/mt	$0.01/mt
Nickel	$1.00/mt	$0.01/mt
Zinc	$0.50/mt	$0.01/mt

Rounding is performed at the final stage of each prompt level's calculation, and not at individual component spread VWAPs level. The rounded value is used in any subsequent calculations that rely on priced prompts.

Minimum volume requirements:
Additional VWAP Closing Price Methodology

	3m MVR	Spread MVR[7]
Aluminium	5	5
Copper	5	5
Lead	5	5
Nickel	5	5
Zinc	5	5

Metals not using the Additional VWAP Closing Price methodology[8]

	3m MVR
Cobalt	5

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[6] 3-month established by VWAP (if MVRs not met, Last Price methodology used). All other prompts valued using existing last price methodology.

[7] The MVR for non-anchor prompts considers all the volume from the spreads that contribute to pricing it

[8] 3-month established by VWAP (if MVRs not met, Last Price methodology used). All other prompts valued using existing last price methodology.

Aluminium premiums (M1), aluminium alloy and NASAAC	5
Tin	5

These minimum volume requirements have been included to allow the methodology to be flexible. The LME believes there is an advantage to having all MVRs set as 5, to avoid situations where very small volumes can impact prices (e.g 2 lots trades at the start of a pricing window). In cases where the MVR is not met, under the Last Price methodology, the LME will determine prices using the Last Price methodology. However, under the Additional VWAP Closing Price methodology, where the MVR is not met, a TWAP shall be used to determine prices.

1.1.2   Calculation (FC methodology)

Anchor Contracts

Each Anchor Contract is priced based on the following waterfall:

1. If the total volume of trades during the Anchor Pricing Window is equal to or above the Outright MVR, the Closing Price will be the VWAP of outright trades in the Anchor Contract during the Anchor Pricing Window
2. If the total volume of trades during the Anchor Pricing Window is below the Outright MVR, the Closing Price will be the TWAP of the Indicator Reference Price for the Anchor during the Anchor Contract Pricing Window

Spread VWAP Contracts

In order as listed, each spread VWAP Contract is priced using the following waterfall:

1. The Closing Price will be the VWAP of the VWAP Instruments for the respective spread VWAP Contract during the spread Pricing Window, where the price used in the VWAP will be the traded spread price, applied to the already established price for the other contract.
2. If the total volume of all trades considered in this calculation is below the respective spread MVR, the Closing Price will be the TWAP of Indicator Reference Price of the TWAP Instrument during the spread Pricing Window, applied to the already established price for the other contract.

For clarity, where there are multiple spreads, the MVR will be compared to the sum of the volumes across all spreads.

Indicator Reference Price ("IRP")

> If trades have occurred during current day:
>> If [Current Bid[9] > Last Trade] Then [IRP = Current Bid]
>> If [Current Offer < Last Trade] Then [IRP = Current Offer]
>> Otherwise [IRP = Last Trade]
> If no trades during current day:
>> If [Current Bid > Previous Close] Then [IRP = Current Bid]
>> If [Current Offer < Previous Close] Then [IRP = Current Offer]
>> Otherwise [IRP = Previous Close]

In the event that a Previous Close value is not available, which can occur if the 3M date was not tradable on the previous day, a linear interpolation is performed between the nearest available priced dates either side of the required date.

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[9] Bids and offers during the relevant TWAP period.

Calendar days are used as the basis of interpolation if the two points are in Contango, otherwise Business days are used.

Interpolation Examples
Business Date: 28-Feb-2023
3M Prompt: 30-May-2023

| Date | Date Type | Previous Close | |
| | | Zinc | Lead |
		Backwardation	Contango
26/05/2023		**2,988.50**	**2,111.50**
27/05/2023	Weekend	NA	2,111.65
28/05/2023	Weekend	NA	2,111.81
29/05/2023	Bank Holiday	NA	2,111.96
30/05/2023		**2,988.38**	**2,112.12**
31/05/2023		**2,988.25**	**2,112.27**

Zinc - Backwardation - Business Days

Lead - Contango - Calendar Days
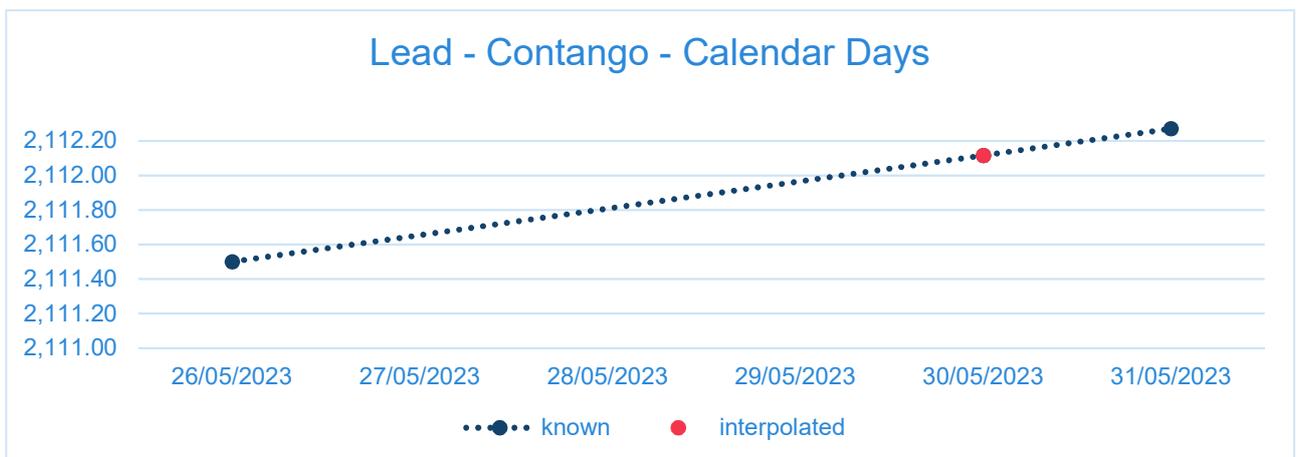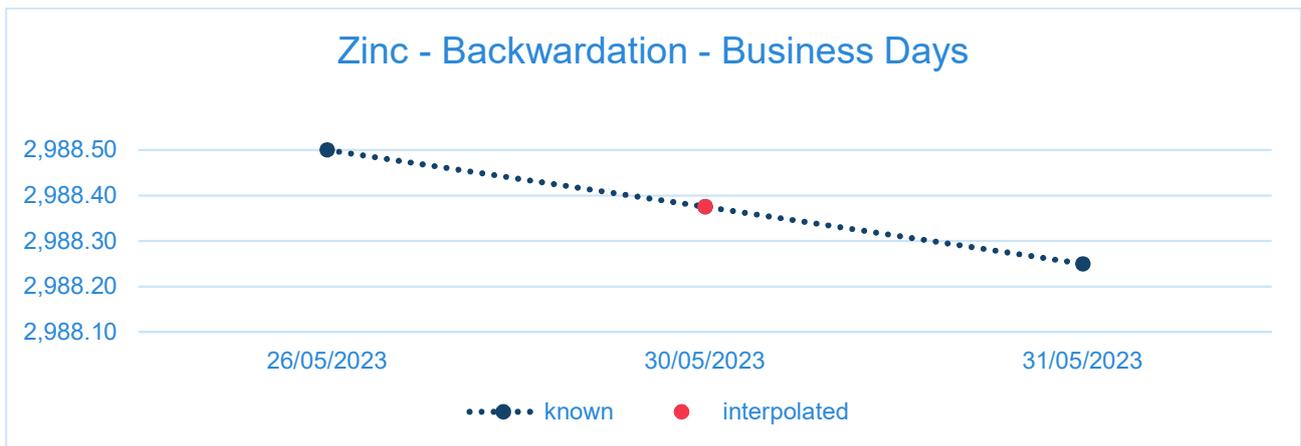
1.2   Rest-of-curve (RC) methodology

When pricing the rest of the forward curve, including both the daily prompt dates and the longer dated monthly contracts, the LME's existing last price with expert judgement methodology will be used. It should be noted that the RC methodology will always follow after the completion of the FC methodology. As such prices

established during the FC methodology will not be changed on the basis of data considered within the RC methodology.

2   Pricing examples for the front-of-curve methodology

The below example prices Copper on 15 April 2021 (such that M1 is the April 3rd Wednesday contract, and 3m is 15 July 2021). The prices used are for example only, and are not the prices which traded on 15 April 2021.

3-month Closing Price calculated by a VWAP of all 3-month trades between 16:45-16:50 eg $9,201
Jun (M3), May (M2), Jul (M4) and Apr (M1) are then all calculated in this order using trades between 16:40 and 16:45: Please note as per convention, backwardations are noted as a positive number and contango as negative

Jun21 (M3) price is calculated as VWAP of all Jun21-3M (M3-3M) spread trades, applied to 3M:

Instrument	Volume (lots)	Spread price	Known basis price	Price used in VWAP i.e. the 3m price +/- the spread price	VWAP price * volume
Jun21-3m	100	$5		$9,206	$920,600
Jun21-3m	50	$4		$9,205	$460,250
Jun21-3m	200	$4.5	$9,201	$9,205.5	$1,841,100
Jun21-3m	25	$5		$9,206	$230,150
TOTAL	375				$3,452,100

Established Jun21 price: $9,205.60

May21 (M2) price is then calculated as VWAP of all May21-Jun21 (M2-M3) trades, and May21-3m (M2-3m) trades:

Instrument	Volume (lots)	Spread price	Known basis price	Price used in VWAP	VWAP price * volume
May21-Jun21	50	$2.25	$ 9205.60	$9207.85	$460,392.5
May21-Jun21	250	$2.5	$ 9205.60	$9208.1	$2,302,025
May21-3m	5	$7.5	$9,201	$9,208.5	$46,042.5
May21-3m	15	$7	$9,201	$9,208	$138,120
Total	320				$2,946,580

Established May21 price: $9,208.06

Jul21 (M4) price is then calculated as VWAP of all May21-Jul21 (M2-M4), Jun21-Jul21 (M3-M4) and 3m-Jul21 (3m-M4) trades:

Instrument	Volume	Spread price	Known basis price	Price used in VWAP	VWAP price * volume
May21-Jul21	5	$6	$9,208.06	$9,202.06	$46,010.30
May21-Jul21	1	$4	$9,208.06	$9,204.06	$9,204.06
Jun21-Jul21	500	$3	$9,205.6	$9,202.6	$4,601,300
3m-Jul21	100	$0	$9,201	$9,201	$920,100
3m-Jul21	70	-$0.5	$9,201	$9,201.5	$644,105
Total	676				$6,220719.36

Established Jul21 price: $9,202.25 (rounded up from $9,202.2474)

Apr21 (M1) price is then calculated as VWAP of all Apr21-May21 (M1-M2), Apr21-Jun21 (M1-M3), Apr21-3m (M1-3m) and Apr-Jul21 (M1-M4) trades. If we assume there were no trades in any of those carries (during the spread Pricing Window), then Apr21 (M1) is priced as the TWAP of the Indicator Reference Price of Apr21-May21 (M1-M2), applied to the already established May21 (M2) price.

So given the following activity on Apr21-May21:

      Previous day's Closing Price $3

      Last trade prior to the Spread Pricing Window was $3.75

      16:46 - 10 lot Bid at $4 entered (no orders in the book prior to this)

      16:47 - 100 lot Offer at $4.5 entered

      16:48 - 10 lot Bid at $4 removed

      16:49 – 50 lot Offer at $3.5 entered

Then the IRP for the following periods is:

Time Period	Duration of period	IRP of spread	Duration * IRP used in TWAP
16:45 – 16:46	1 minute	$3.75 (no current orders, so use Last Trade)	$3.75
16:46 – 16:48	2 minutes	$4 (bid is higher than Last Trade. The higher $4.5 offer at 16:47 does not change the IRP)	$8
16:48 – 16:49	1 minutes	$3.75 (no better bid or offer than Last Trade)	$3.75
16:49 – 16:50	1 minutes	$3.5 (current offer is below Last Trade)	$3.5
Total	5 minutes		$19

The TWAP of Apr21-May21 (M1-M2) is $3.8 ($19 / 5 minutes)

Established Apr21 price: $9,212.4 (rounded from $9208.6 + $3.8)

Whole minutes are used in this example for simplicity. The calculation will actually be done at a millisecond level as per market data timestamping.

Cash price is then calculated as the VWAP of Cash-Apr21 (Cash-M1). If we assume that there were no trades (during the spread Pricing Window), then Cash is priced on the basis of the TWAP of the IRP of Cash-Apr21.

If there have been no trades in Cash-Apr21 during the current trading day, then the IRP uses the previous day's Closing Price as reference (which will use today's Cash prompt date 19 Apr 2021, rather than the previous day's Cash prompt date).

If we assume the previous day's Closing Price for (today's) Cash-Apr21 was $0.5 and the bid/offer in Cash-Apr21 during the Spread Pricing Window was constant at $0 / $1, then the TWAP will only use the $0.5 from the previous day (as there is no better bid or offer).

Established Cash price: $9212.90 (9212.40 + 0.5)