

Autumn readiness – proposed revision to the Balancing Merit Order tie- break rules

3 December 2019

Minimum STEM Price reached for the first time

- On Saturday 12 and Sunday 13 October 2019, the Balancing Price cleared at the Minimum STEM Price
 - First time in the WEM
 - Three intervals
 - Low demand was the main contributor to this price event, with operational demand dropping to an all-time minimum of 1,159 MW
- Clearing at the price floor raises concerns for generator de-commitment and system security
- This presentation will cover:
 - How the Forecast Balancing Merit Order is determined
 - The current tie-break methodology
 - Conclusions for Power System Security
 - AEMO's approach to revising the tie-break methodology

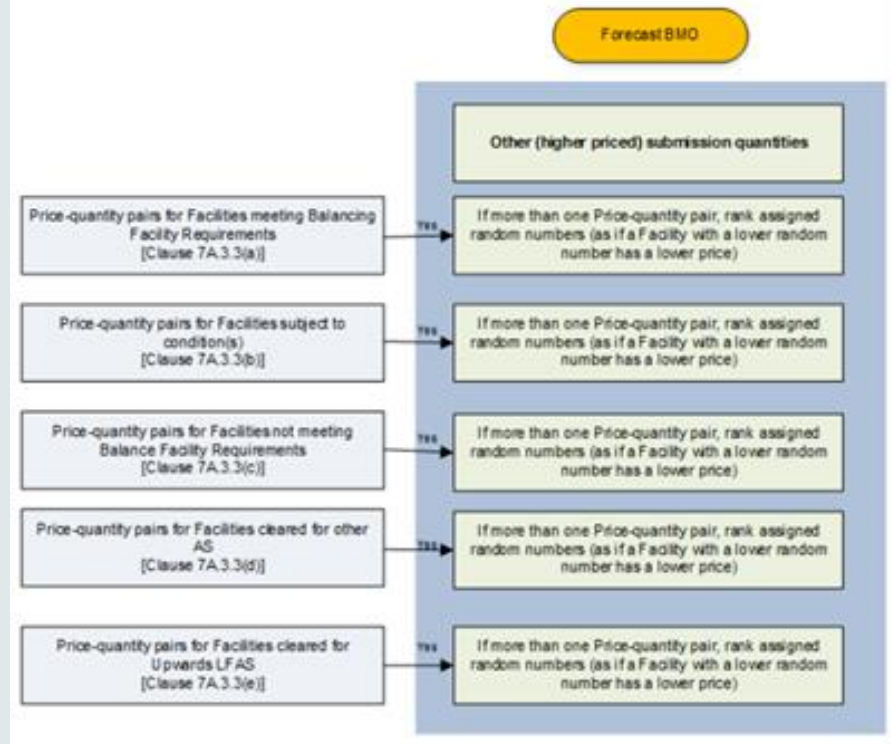
Current BMO order

- The objective of the Balancing Merit Order (BMO) appears to be to dispatch the lowest-cost combination of Facilities [WEM Rule 7A.1.3(b)]
 - Assuming no security constraints
- The BMO is determined by WEM Rule 7A.3.2:
 - Convert all prices to Loss Factor Adjusted Prices except for the Balancing Portfolio
 - Loss Factor Adjusted Price: Means, in respect of any price, that price divided by any applicable Loss Factor for the relevant Facility but any resulting price exceeding the Price Caps, must be adjusted to the relevant Price Cap
 - This means the lowest Loss Factor Adjusted Price is -\$1000
 - Sort lowest to highest by Loss Factor Adjusted Price
 - Break ties as specified in the Market Procedure: Balancing Market Forecast

Tie-break process

- Tie-break process in the Procedure:
 - 4.2.1 Prior to the start of each Trading Day, AEMO must assign a unique random number to each Balancing Facility, including the Balancing Portfolio
 - 4.2.2 When AEMO is required to assign priority to break a tie for a Trading Interval in which a tie occurred, AEMO will:
 - (a) where that price equals either the Alternate Maximum STEM Price or the Maximum STEM Price, sort the affected Price-Quantity Pairs as if the Facility with the highest random number had the highest price;
 - (b) where that price equals the Minimum STEM Price, sort the affected Price-Quantity Pairs, as if the Facility with the lowest random number had the lowest price; and
 - (c) where that price does not equal the Minimum STEM Price, the Maximum STEM Price or the Alternate Maximum STEM Price, sort the affected quantities in ascending order as if the Facility with the lowest random number had the lowest price.
- However, on 1 July 2019, the Rules and the Procedure changed, and now doesn't align with WEMS ordering at the maximum or minimum price
- The actual order used at the Minimum STEM Price is shown in the diagram
 - Facilities assigned to categories
 - Within each category, ordered randomly

Figure 2 Ranking Quantities priced at the Minimum STEM Price2



Current outcomes of the tie break process and proposed approach

- If Facilities offer at:
 - -\$200, the Facility with the higher Loss Factor will always be curtailed first, before any other Facility
 - If two Facilities have the same Loss Factor Adjusted Price outcome, then random
 - The Minimum STEM Price, the Facility within each category with the highest random number will always be curtailed first, before each of the other Facilities
- Conclusions
 - The ordering at the Minimum STEM Price doesn't provide the most economical order of dispatch
 - AEMO may be required to dispatch Out of Merit to avoid a High Risk State merely because the Balancing Price equals the Minimum STEM Price
 - The use of categories is beneficial, but the random ordering within those categories is not
 - If the BMO at the Minimum STEM Price helps at all, it's largely by accident
 - We predict more Trading Intervals at the Minimum STEM Price, so we need a better tie-break process
- Review approach
 - Identify the optimal dispatch order at periods of low and high demand
 - When the Balancing Price might equal the Minimum STEM Price or the Maximum STEM Price
 - Include security constraints
 - Investigate different tie-breaking methods using Balancing Submissions and Standing Data to most approximate the optimal dispatch order to allow automatic creation of the BMO

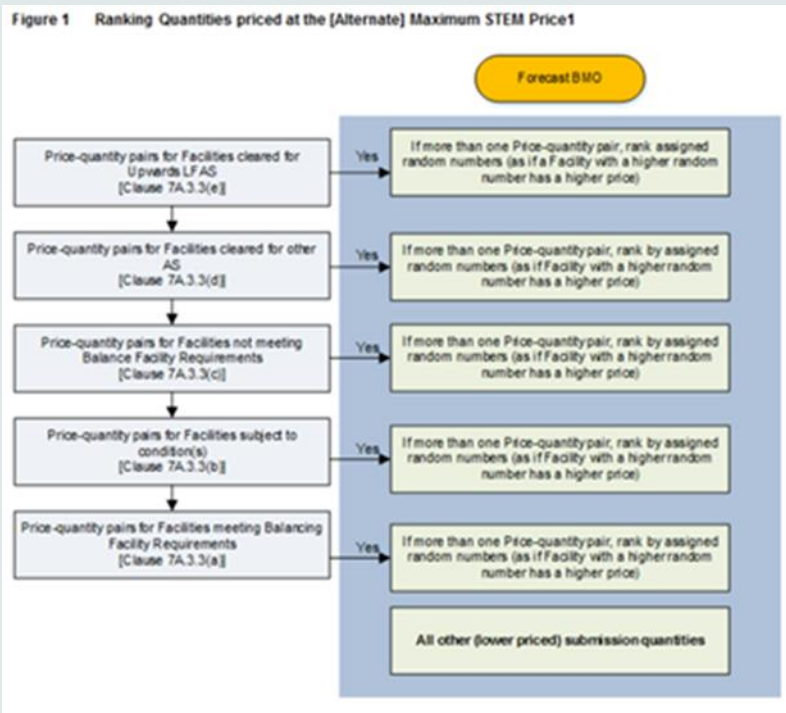
Minimum STEM Price

- Issue: currently can't differentiate energy supplied at the Minimum STEM Price (which can be curtailed) from true minimum generation (which requires desynchronisation)
- AEMO proposes:
 - Requiring Minimum Generation to be bid as a separate tranche from other energy at the Minimum STEM Price
 - WEMS includes a new code to differentiate
 - No system validation – compliance approach
- The best fit to the optimal dispatch order at the Minimum STEM Price comes from:
 - Categorising Balancing Submission tranches by type of energy provision, then
 - Ordering categories, then
 - Within each category, sort based on a combination of maximum generation achievable and Standing Data synchronisation times

Category (order of solve, highest to lowest)	Tie break methodology
Energy above minimum generation (for Non-Scheduled and Scheduled Generation)	1. Rank as if the Facility with the highest maximum MW able to be provided in interval had the <u>highest</u> price, where Maximum MW is calculated by: <ul style="list-style-type: none"> a) If first tranche in BMO, then Ramp Rate Limit x (30min – Sync Time min) b) If not first tranche in BMO, then Ramp Rate Limit x 30min, then 2. Random
Balancing non-active Facilities	1. Random
Minimum generation where no Ancillary Services provided	1. Rank as if the Facility with the highest warm synchronising time (minutes) had the <u>lowest</u> price, where sync time for portfolio is max of all Portfolio Facilities, then 2. Random
Ancillary Service (AS) – AS requirement and minimum generation	1. Random

Maximum and Alternate Maximum STEM Price

- Current WEMS approach:



- The best fit to the optimal dispatch order comes from:
 - Categorising Balancing Submission tranches by type of energy provision, then
 - Ordering categories, then
 - Within each category, sort based on a combination of maximum generation achievable and Standing Data synchronisation times
- Propose (highest to lowest):
 - Ancillary Service energy – rank as if the Facility with the highest random number had the highest price, then for
 - Other energy - rank as if the Facility with the highest maximum MW able to be provided in interval had the lowest price, where Maximum MW is calculated by:
 - If first tranche in BMO, then Ramp Rate Limit x (30min – Sync Time min)
 - If not first tranche in BMO, then Ramp Rate Limit x 30min

Between Minimum and Maximum price caps

- Proposed tie break approach between minimum and maximum prices:
 - Rank as if the Facility with the highest maximum MW able to be provided in interval had the lowest price, where Maximum MW is calculated by:
 - If first tranche in BMO, then Ramp Rate Limit x (30min – Sync Time min)
 - If not first tranche in BMO, then Ramp Rate Limit x 30min
 - Then random

Implementation

- The proposed tie break approach will require changes to:
 - Market Procedures:
 - Balancing Market Forecast - the updated tie-break methodology
 - Balancing Facility Requirements – obligations upon Participants
 - WEMS systems for Balancing Submissions
 - New codes to separate tranches at the Minimum STEM Price
 - Note, AEMO intends to use compliance (not system validation) to enforce behaviour
 - WEMS systems for BMO ordering
 - New categorisation and data input (synchronisation times, new tranches and ramp rates)
 - Tie-break methodology
- Next steps:
 - Consideration of maximum ramp rate limitations under WEM Rule 7A.1.6(a)iii.
 - Procedure Change Process
 - Update to WEMS
 - Consideration of Balancing non-active facilities