Minimum STEM price review 2021

Draft determination report

2 July 2021

Economic Regulation Authority
WESTERN AUSTRALIA

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Invitation to make submissions

Submissions are due by 4:00 pm WST, Monday, 16 August 2021

The ERA invites comment on this paper and encourages all interested parties to provide comment on the matters discussed in this paper and any other issues or concerns not already raised in this paper.

We would prefer to receive your comments via our online submission form https://www.erawa.com.au/consultation

You can also send comments through:

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Please note that submissions provided electronically do not need to be provided separately in hard copy.

All submissions will be made available on our website unless arrangements are made in advance between the author and the ERA. This is because it is preferable that all submissions be publicly available to facilitate an informed and transparent consultative process. Parties wishing to submit confidential information are requested to contact us info@erawa.com.au.

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Executive summary

The Wholesale Electricity Market's balancing market includes both minimum and maximum price caps.[1] The maximum price caps are a measure for mitigating abuse of market power by limiting the maximum price at which a generator can offer electricity. The minimum price cap, called the minimum Short Term Energy Market (STEM) price, is the lowest price that electricity can be offered into the balancing market and facilitates the dispatch of economically efficient electricity.[2, 3] The minimum STEM price is -$1,000 per Megawatt-hour (MWh) and has not changed since the start of the balancing market in 2012.

Following a change to the Wholesale Electricity Market (WEM) Rules in August 2020, the Economic Regulation Authority is required to review annually the minimum STEM price. This report contains the ERA's draft determination for its first review.

The review of the minimum STEM price follows a two-step process. First, the ERA must consider whether the minimum STEM price is "appropriate". Appropriate in the context of this review means that the ERA's analysis of the review criteria under the WEM Rules, including the objectives of the minimum STEM price, do not indicate that the minimum STEM price is too high or too low. Second, if the ERA determines that the minimum STEM price is not appropriate, then the ERA must revise the minimum STEM price following the procedure set out in the WEM Rules.[4]

The objectives of the minimum STEM price in the WEM Rules require the minimum STEM price to:[5]

- Allow the balancing market to clear above the minimum STEM price in most circumstances.
- Limit market participants' financial exposure to balancing prices that would threaten their financial viability.

These objectives seek to ensure that the minimum STEM price is not set too high or too low.

If the minimum STEM price is too high, it will limit the extent to which generators can bid at prices to differentiate themselves from other generators. The entrance of cheaper renewable energy generators such as windfarms, which compete with more expensive coal and gas generators, and the penetration of rooftop solar lowering daytime demand, means that there could be periods when baseload generators are not the most cost-effective source of electricity and therefore must shut down. However, due to the costs of shutting down, some generators may be willing to bid at lower prices to ensure that they remain on and generating rather than incurring these shutdown costs.[6]

Conversely, if the minimum STEM price is too low, generators that must bid at the minimum STEM price, such as ancillary service providers, may be exposed to financial losses where the balancing market settles at the minimum STEM price.

1 The Wholesale Electricity Market Rules defines "price cap" to include the maximum and minimum price for the balancing market – Wholesale Electricity Market Rules (WA), 1 February 2021, Chapter 11.

2 The minimum STEM price is the minimum price in both the STEM and balancing markets. The WEM Rules require this review to focus on the minimum STEM price and its effect on the balancing market only.

3 The economically efficient dispatch of electricity is the preference to dispatch cheaper priced electricity ahead of more expensively priced electricity.

4 Wholesale Electricity Market Rules (WA), 1 February 2021, Rules 6.20.17 to 6.20.20

5 Ibid, Rule 6.20.16

6 The costs of shutting down and restarting a generator include fuel, maintenance, and opportunity costs.

To consider the above objectives, the ERA must assess the mandatory criteria in the WEM Rules for the review period 1 October 2019 to 31 January 2021. These criteria include evaluating the trading intervals where the market settled at the minimum STEM price, considering the Australian Energy Market Operator's (AEMO) dispatch for trading intervals that were forecast to settle at the minimum STEM price and assessing any changes in the generation fleet during the review period.[7] The ERA has considered whether any of the criteria indicate that the minimum STEM price is too high or too low.

The ERA concludes that none of the mandatory criteria indicate that the minimum STEM price is not appropriate. Specifically:

- The balancing market settled at the minimum STEM price for nine trading intervals during the review period due to temporary supply factors rather than the minimum STEM price being too high. These factors included up to 700 MW of electricity offered at the minimum STEM price by ancillary service generators and for commissioning activities. This led to a surplus of energy at the minimum STEM price for all nine trading intervals.
- There were no trading intervals during the review period where AEMO had to dispatch down a generator due to the minimum STEM price being too high. Where there is an oversupply of electricity from generators bidding at the minimum STEM price, AEMO may need to dispatch down one of these generators, for example, if another generator could not be decommitted.[8] This could indicate that the minimum STEM price is not low enough to allow generators to differentiate themselves based on price. This did not occur during the review period.
- There have been no changes to the generation fleet resulting in substantive changes to relevant generators cycling costs that would mean that the minimum STEM price is too low or too high.

The ERA received submissions from four stakeholders to the issues paper published in March 2021 that outlined the ERA's preliminary findings and conclusions. All submissions supported the ERA's assessment of the mandatory criteria.

While they supported the ERA's findings, three participants (Bluewaters, NewGen Power Kwinana and Synergy) still considered that the current minimum STEM price of -$1,000/MWh was not appropriate, and that a higher price would better meet the minimum STEM price objectives. These participants stated that a higher minimum STEM price of -$250/MWh would still meet the first objective, to allow the balancing market to clear above the minimum STEM price in most circumstances.[9]

The ERA considered the implications of a higher minimum STEM price. If the minimum STEM price had been set at a higher level (for example, -$250/MWh), the ERA's analysis found that the balancing market would have settled at this higher minimum STEM price more often over the review period.[10]

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7 Wholesale Electricity Market Rules (WA), 1 February 2021, Rule 6.20.14

8 This assumes for example, that the tiebreaker process would decommit a generator that may be required by AEMO for system security reasons. The tiebreaker process is used to determine the order of tied quantities in the balancing merit order by assigning a random number each day to each balancing facility – Australian Energy Market Operator, 2019, *Market Procedure: Balancing Market Forecast*, pp. 10-11.

9 The WEM Rules sets out the process for how the ERA is to revise the minimum STEM price if it is not appropriate. The ERA does not have discretion to choose any price and must follow the process in clauses 6.20.17 to 6.20.20 of the WEM Rules.

10 During the review period, the balancing market settled nine times at -$1,000/MWh. If the minimum STEM price had been set at a higher price, for example -$250/MWh, the balancing market would have settled there 11 times.

In future, a higher minimum STEM price of -$250/MWh may attract more electricity to be bid at this level when compared to the current quantities bid at -$1,000/MWh. This is because generators that bid at and between the current -$1,000/MWh minimum STEM price and -$250/MWh would likely bid these quantities at the higher floor price of -$250/MWh.

Further, a higher minimum STEM price reduces the financial exposure for generators and so generators that bid above -$250/MWh may be willing to take on additional financial risk and change their bids to the higher minimum STEM price.

Greater quantities of electricity bid at the higher minimum STEM price (-$250/MWh) means there is greater opportunity for the balancing market to settle at the minimum STEM price more frequently. Where the balancing market settles at the minimum STEM price frequently, this is not consistent with the objective for the balancing market to settle above the minimum STEM price in most circumstances. The balancing market does not settle at the current minimum STEM price of -$1,000/MWh frequently and is therefore meeting this objective.

Bluewaters, NewGen Power Kwinana and Synergy stated that a higher minimum STEM price may also better achieve the second objective, by limiting the extent that market participants are exposed to financial losses where the balancing market settles at the minimum STEM price. The second objective of the minimum STEM price is to limit market participants' financial exposure to balancing prices that would threaten their financial viability

Sustained exposure to the current minimum STEM price may threaten the financial viability of a market participant. However, the data during and since the review period shows that the balancing market rarely settled at the minimum STEM price. There have not been frequent or sustained periods where the balancing market has settled at the minimum STEM price. Further, these submissions did not provide any evidence that a market participant's financial viability had been, or was likely to be, threatened. The last time the market settled at the minimum STEM price was 12 September 2020.[11]

From its analysis of the mandatory criteria and following consideration of stakeholders' submissions, the ERA concludes that the current minimum STEM price is meeting its objectives because:

- The ERA's analysis of the mandatory criteria shows that the current minimum STEM price is neither too high nor too low.
- The current minimum STEM price has allowed the balancing market to settle above the minimum STEM price in most circumstances in the review period and there have been no minimum STEM price trading intervals since the review period ended.
- No evidence had been presented by market participants that would indicate that the current minimum STEM price has resulted in market participants being exposed to balancing prices (equal to the minimum STEM price) that will threaten their financial viability. There is no evidence that there will be any change to this in the next review period.

The ERA's draft determination is that the current minimum STEM price is appropriate. This means it is not necessary to revise the minimum STEM price.

The ERA invites submissions on this draft determination and any other matters stakeholders consider relevant to this assessment.

[11] The balancing market settled at the minimum STEM price for two consecutive trading intervals on 12 September 2020. See Table 1 for more details.

1. Introduction

This report contains the ERA's analysis and draft determination of whether the current minimum STEM price is appropriate within the balancing market.[12]

The review period is from 1 October 2019 to 31 January 2021 with the WEM Rules defining the scope of the review as:[13]

> 6.20.13. The Economic Regulation Authority must annually review the value of the Minimum STEM Price and must:
>
> (a) determine whether the Minimum STEM Price is appropriate in accordance with clause 6.20.14; and
>
> (b) subject to clause 6.20.15, determine the value of the Minimum STEM Price, with reference to clause 6.20.16 and in accordance with clauses 6.20.17 to 6.20.20, where the Economic Regulation Authority determines that the current value of the Minimum STEM Price is not appropriate.

This review does not consider whether a floor price is needed in the WEM's balancing market, as that consideration is not within the review's scope specified in clause 6.20.13.[14]

As part of the ERA's determination, the ERA must consider the objectives of the minimum STEM price, which are to:[15]

> 6.20.16 …
>
> (a) allow clearance of the Balancing Market without the Balancing Price being equal to the Minimum STEM Price in most circumstances; and
>
> (b) subject to clause 6.20.16(a), limit Market Participants' exposure to Balancing Prices that would threaten the financial viability of a prudent Market Participant.

To determine whether the current minimum STEM price is appropriate, the ERA has considered each mandatory criterion in clause 6.20.14 of the WEM Rules, as well as stakeholder submissions.[16] Chapters 3 to 6 of this draft determination contain the ERA's findings and conclusions for each criterion.

The ERA then considered whether the ERA's analysis of the mandatory criteria and the information provided by market participants supports a conclusion that the minimum STEM price is achieving the objectives in clause 6.20.16 of the WEM Rules. Chapter 7 of this draft determination sets out the ERA's considerations of these requirements.

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12 Wholesale Electricity Market Rules (WA), 1 February 2021, Rule 6.20.14

13 The WEM Rules require the ERA to examine the period from at least 1 October 2019 – Wholesale Electricity Market Rules (WA), 1 February 2021, Rule 1.35.2

14 The ERA is required to review the Energy Price Limits, including the minimum STEM price once every five years. Matters not within scope of this review may be considered in the five-yearly review of Energy Price Limits. The next Energy Price Limits review is not scheduled to begin until after 1 October 2022.

15 Wholesale Electricity Market Rules (WA), 1 February 2021, Rule 6.20.16

16 Ibid, Rule 6.20.14 - These criteria include evaluating the trading intervals where the market settled at the minimum STEM price (rule 6.20.14(a)), considering AEMO's dispatch for trading intervals that were forecast to settle at the minimum STEM price (rule 6.20.14(b)) and assessing any changes in the generation fleet during the review period (rule 6.20.14(c)).

A revised value for the minimum STEM price is required only if the ERA determines that the minimum STEM price is not appropriate.[17] The ERA's draft determination is in chapter 8.

Stakeholders have six weeks to provide submissions on the ERA's draft determination.[18] The ERA will then prepare and publish its final determination.

[17] Ibid, Rule 6.20.13(b)

[18] Ibid, Rule 6.20.27

2. Criteria for determining whether the minimum STEM price is appropriate

The ERA must consider the following mandatory criteria when determining whether the minimum STEM price is appropriate:[19]

- Criterion 1: Whether the balancing market settled at the minimum STEM price in one or more trading intervals because the minimum STEM price was too high - for example, if the minimum STEM price was not low enough to induce generators to decommit.
- Criterion 2: Whether AEMO dispatched facilities during the review period below the quantities that were forecast to clear because the minimum STEM price was too high. This criterion requires considering trading intervals where the balancing market was forecast to settle at the minimum STEM price (but did not necessarily settle at the minimum STEM price), and whether AEMO decommitted a generator priced at the floor because another generator also priced at the floor did not decommit.
- Criterion 3: Changes in the generation fleet in the South West Interconnected System (SWIS) during the review period, such as the addition or retirement of generators and increased or decreased generator start-up and shutdown costs. For example, a coal generator with high start-up and shutdown costs that has had an upgrade that materially reduces these costs may indicate that the minimum STEM price could be higher.

The ERA must also consider the reasons provided by market participants for whether they view the minimum STEM price as appropriate. No market participants notified the ERA during the review period that the current minimum STEM price was not appropriate.

The ERA conducted preliminary analysis of the above criteria and published an issues paper in March 2021 inviting stakeholder submissions.[20]

In response to the issues paper, the ERA received submissions from Alinta, Synergy, Bluewaters and NewGen Power Kwinana. The ERA has considered these submissions when assessing the above criteria in chapters 3 to 6 and the objectives of the minimum STEM price in chapter 7.[21]

[19] Ibid, Rule 6.20.14

[20] Economic Regulation Authority, 2021, *Minimum STEM price review 2021 – Issues paper and preliminary findings.*

[21] Submissions to the issues paper are available on the review's website: Economic Regulation Authority, 'Minimum STEM Price Review', (online).

3. Criterion 1 - Trading intervals when the balancing market settled at the minimum STEM price

The ERA must determine if the balancing market price settled at the minimum STEM price due to the minimum STEM price being too high:

> 6.20.14. In determining whether the Minimum STEM Price is appropriate under clause 6.20.13(a), subject to clause 1.35.2, the Economic Regulation Authority must consider without limitation, if since the last annual review of the Minimum STEM Price under clause 6.20.13:
>
> (a) the Balancing Market has settled at the Minimum STEM Price in one or more Trading Intervals because, in the Economic Regulation Authority's reasonable opinion, the Minimum STEM Price was too high;
>
> …

To determine this criterion, the ERA:

1. Identified all trading intervals where the balancing market settled at the minimum STEM price during the review period.
2. Identified the reasons that the balancing market settled at the minimum STEM price for the identified trading intervals.[22]
3. Determined whether the balancing market settled at the minimum STEM price because the price was too high or for other reasons.

3.1 Trading intervals during the review period

There were nine out of 23,472 trading intervals during the review period where the balancing market settled at the minimum STEM price (Table 1).[23, 24]

Table 1: Trading intervals that settled at the minimum STEM price

Calendar date	Interval starting	Final demand RDQ[25] (MW)
12 October 2019	1:00pm	1,200
13 October 2019	12:00pm	1,157
13 October 2019	1:00pm	1,167

[22] This analysis was expanded to assess other low demand intervals within the review period. Details are in section 3.4 of this report.

[23] The remaining trading intervals in the review period settled above the minimum STEM price (which equated to 99.96 per cent of the 23,472 trading intervals in the review period).

[24] Clause 1.35.2 of the WEM Rules specifies that the first review period commences on 1 October 2019 but does not specify if this refers to a trading day which commences at 8:00am or a calendar day which commences at 12:00am. The ERA has interpreted the review period to start from the 12:00am half-hour interval starting on 1 October 2019 and end at the interval starting 11:30pm on 31 January 2021.

[25] Relevant Dispatch Quantity (RDQ) means, for a trading Interval, the sum of the end of interval quantities of electricity (EOI Quantities) for each balancing facility, in Megawatts (MW). Forecast RDQ represents forecast demand and final RDQ represents final demand. These figures have been rounded to the nearest MW.

Calendar date	Interval starting	Final demand RDQ[25] (MW)
15 August 2020	10:00am	1,435
15 August 2020	11:30am	1,270
15 August 2020	12:00pm	1,262
12 September 2020	12:30pm	1,030
12 September 2020	1:30pm	1,053
12 September 2020	2:00pm	1,118

Source: ERA analysis of market data.

The balancing market will settle at the minimum STEM price when the quantity of electricity bid at the minimum STEM price is equal to or greater than the quantity of electricity demanded for that trading interval. This situation can occur when demand for electricity is low and there is a surplus of generators offering cheap electricity at the minimum STEM price.[26] This surplus may be a result of generators being required to bid some of their electricity at the minimum STEM price under the WEM Rules where they intend to provide ancillary services, are approved for commissioning tests, or are non-active balancing generators.[27,28]

Generators' commercial decisions may also contribute to the surplus of generation bid at the minimum STEM price. For example, generators with high cycling costs may seek to avoid shutting down for short periods of time so that they do not incur shutdown and restart costs. Generators may also bid their minimum generation quantities at the floor when they expect prices will exceed their reasonable expectation of their short run marginal cost and they do not expect to have market power.[29]

A further commercial reason for generators to bid at the minimum STEM price may be due to contractual requirements. For example, a cogeneration plant may have a physical contractual requirement to supply steam to an industrial party. The steam is a by-product of the plant's electricity production. To fulfil its contractual obligations, the plant may bid at the minimum STEM price to secure dispatch to provide electricity and therefore produce steam under the contract.

Together, these quantities form the amount of generation bid at the minimum STEM price, which varies from trading interval to trading interval. Understanding the composition of the quantities bid at the minimum STEM price will assist in assessing whether the balancing market settled at the minimum STEM price because the price was too high or for other reasons, as described in the following sections.

26 Due to the continuous uptake of residential solar panels, the demand for electricity in the WEM has been low around midday, particularly on weekends.

27 Generators providing ancillary services are required to bid at the minimum STEM price to ensure these generators are dispatched ahead of other generators offering electricity at the minimum STEM price – Wholesale Electricity Market Rules (WA), 1 February 2021, Rules 7A.2.3 (commissioning test quantity) and 7A.3.5 (LFAS quantity).

28 A non-active balancing generator is a generator that AEMO has determined does not meet the Balancing Facility Requirements in the Balancing Facility Requirements Market Procedure – Australian Energy Market Operator, 'Balancing Market Participation', (online) [accessed 5 February 2021].

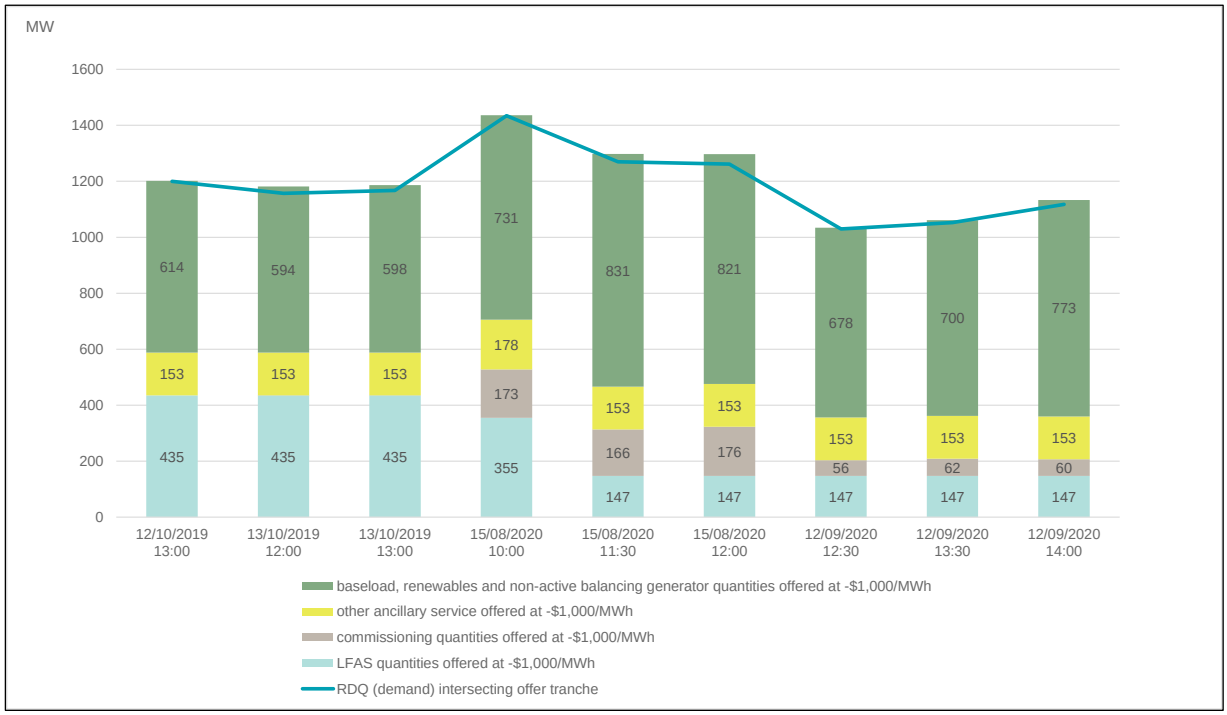
29 Wholesale Electricity Market Rules (WA), 1 February 2021, Rule 7A.2.17

3.2 Observations for the nine trading intervals that settled at the minimum STEM price

Clause 6.20.14(a) of the WEM Rules requires the ERA to consider whether the balancing market settled at the minimum STEM price because the minimum STEM price was too high. The ERA analysed the nine trading intervals that settled at the minimum STEM price during the review period to consider the reasons why the balancing market settled at that price. Detailed analysis for each of the nine trading intervals is contained in Appendix 3 with a summary of the ERA's observations presented below.

Figure 1 shows the nine trading intervals when the balancing market settled at the minimum STEM price and the composition of those quantities.

Figure 1: Generator offer categories for the nine minimum STEM price trading intervals



Source: ERA analysis of market data.

Figure 1 shows that between 23 per cent and 50 per cent of the total quantities submitted at the minimum STEM price were for Load Following Ancillary Services (LFAS) and other ancillary services.[30]

Generators that are cleared to provide downwards LFAS quantities (LFAS Down) must offer their LFAS Down quantities and at least their minimum generation quantity into the balancing market at the minimum STEM price.[31] This ensures that a generator cleared for LFAS Down

[30] LFAS (or Load Following Service) is the service of frequently adjusting: (a) the output of one or more Scheduled Generators; or (b) the output of one or more Non-Scheduled Generators, within a Trading Interval so as to match total system generation to total system load in real time in order to correct any SWIS frequency variations – Wholesale Electricity Market Rules (WA), 1 February 2021, Rule 3.9.1

[31] Downwards LFAS Quantity is defined as 'Means, for a Trading Interval, the Forecast Downwards LFAS Quantity for that Trading Interval used by AEMO under clause 7B.3.3(b) to determine the Downwards LFAS Enablement Schedule – Wholesale Electricity Market Rules (WA), 1 February 2021, Chapter 11

is dispatched to at least its minimum generation quantity plus the LFAS Down amount so that the LFAS Down service can be provided.

The LFAS Down requirement was 85 MW for all nine trading intervals. Up to 435 MW was bid at the minimum STEM price from LFAS generators to meet this requirement.[32]

Separate to the quantities required for LFAS Down, there was up to 178 MW of additional electricity bid at the minimum STEM price to provide spinning reserve. The combined quantities from generators to provide both spinning reserve and LFAS Down services contributed to the large quantities of electricity bid at the minimum STEM price.

The WEM Rules also require generators undertaking commissioning activities to offer their electricity at the minimum STEM price to ensure that they are dispatched to perform these activities. From August 2020, quantities of up to 176 MW were offered at the minimum STEM price for commissioning activities. Generators undergoing commissioning activities contributed to the surplus of cheaply priced generation in the August 2020 and September 2020 trading intervals where the balancing market settled at the minimum STEM price.

Forecast demand was materially higher than the final demand for eight of the nine trading intervals where the balancing market settled at the minimum STEM price. Generators using these forecasts may not have expected the balancing market to clear at the minimum STEM price for these intervals and there was no change to their ancillary services offers or their balancing market offers as price and demand forecasts were updated.

The 1:00pm trading interval on 12 October 2019 was the only trading interval where the market was forecast to clear at the minimum STEM price at the time of gate closure for non-Synergy generators (11:00am). At the time of LFAS gate closure for that trading interval (8:00am), the balancing market was forecast to clear at $27.96/MWh.[33] LFAS generators may not have expected the balancing market to settle at the minimum STEM price when they offered LFAS services.

Renewable generators may bid at negative prices that typically reflect the value of renewable subsidies and any contractual reasons for selling their energy in the balancing market.[34] For all nine trading intervals when the balancing market settled at the minimum STEM price, renewable generators consistently offered between 103 MW and 156 MW at the minimum STEM price.

Generators in the WEM can submit negative offers anywhere between $0/MWh and -$1,000/MWh to price differentiate themselves from others. Generators chose not to use the offer range between -$250/MWh and -$999/MWh for any of the nine intervals when the balancing market settled at the minimum STEM price.

The ERA's preliminary findings presented in the issues paper was that all the above factors led to the oversupply of cheap generation in the nine trading intervals. This led to the balancing market settling at the minimum STEM price for all nine trading intervals.

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[32] This 435 MW consisted of 85 MW for LFAS Down and 350 MW of generation so that each generator cleared to provide LFAS Down could operate.

[33] LFAS gate closure is 3.5 hours prior to the commencement of the trading interval.

[34] An example of renewable subsidy is the large-scale generation renewable certificates (LGC). One LGC certificate is equal to one Megawatt hour of eligible renewable electricity. The price of the LGC certificate has been falling and traded at $39 on 14 February 2019 which is the lowest price – Clean Energy Regulator, 1 March 2019, 'Large-scale generation certificate market update – February 2019', (online) [accessed 11 February 2021]. In addition to the price of LGC, there are potentially other tax advantages relating to the treatment of income from selling these certificates in the market.

3.3 Stakeholder submissions

The ERA's issues paper invited stakeholder submissions on its findings and observations.[35] Submissions were received from Alinta Energy, Bluewaters Power, NewGen Power Kwinana and Synergy. All companies agreed with the ERA's analysis and observations that factors other than the minimum STEM price being too high led to the balancing market settling at the minimum STEM price. Three of the four submissions identified demand forecast inaccuracy as being the most significant factor that led to the market settling at the minimum STEM price during the review period.

Alinta Energy stated that:[36]

> Alinta Energy considers that AEMO's demand forecasts are generally crucial in informing participants' commitment decisions and are therefore likely to have strongly influenced bidding decisions in these nine trading intervals.
>
> …
>
> Alinta Energy considers that over-forecasting demand is the most influential in causing the market to clear at the minimum.

Bluewaters and NewGen Power Kwinana stated:[37, 38]

> Bluewaters considers that forecasting inaccuracies led to bidding behaviour by generators that was not consistent with the final clearing price in the majority of the intervals in question.

Synergy agreed with the ERA's observations that factors other than the level of the minimum STEM price, including over-forecasting of demand and quantities for ancillary services and commissioning, led to the balancing market settling at the floor price for the nine trading intervals.

The submissions also raised a related matter concerning the timing of LFAS and balancing market gate closure, which is the time limit on when market participants can submit their final offers for a trading interval. Three of the four submissions (Synergy, Bluewaters and NewGen Power Kwinana) stated that forecasts closer to the trading interval were generally more accurate and that gate closure times of up to two hours prior to the trading interval inhibited a generator's ability to reflect the more accurate information in their balancing offers. Bluewaters and NewGen Power Kwinana considered that the gate closure times, combined with inaccurate forecasting at the time of gate closure, prevented generators from being able to respond to minimum STEM price events accordingly.

35 Economic Regulation Authority, 'Minimum STEM Price Review', (online) [accessed 28 May 2021].

36 Alinta Energy, Submission to *Minimum STEM price review 2021 – Issues paper and preliminary findings,* p. 2.

37 Bluewaters Power, Submission to *Minimum STEM price review 2021 – Issues paper and preliminary findings*, p. 2.

38 NewGen Power Kwinana, Submission to *Minimum STEM price review 2021 – Issues paper and preliminary findings*, p. 2.

During the review period, the gate closure times were reduced from 1 December 2020. However, gate closure times still remain at least 1.5 hours ahead of the trading interval.[39, 40] In follow-up consultation, some stakeholders indicated that the revised gate closure times had not made a difference to their bidding.

3.4 Further analysis

The submissions by Alinta, Bluewaters and NewGen Power Kwinana stated that over-forecasting of demand was the most influential factor that led to the balancing market clearing at the minimum STEM price (see section 3.3).

The further away from a trading interval that the forecast is, the less accurate it is likely to be as it will be based on older information. During most of the review period, generators were subject to a lag time of between two hours and up to 11 hours from the time the latest relevant forecast was available that generators could act upon. This lag corresponds to the gate closure times under the current market design. Participants will continue to have less accurate forecast signals on which to base their bidding decisions under the current design.[41]

Over-forecasting of demand was a factor for the trading intervals where the market settled at the floor. However, there were other more influential factors. The ERA formed this opinion by considering other low demand trading intervals during the review period that did not settle at the minimum STEM price. The balancing market will settle at the minimum STEM price when the demand for electricity is low and there is a surplus of generators offering at the minimum STEM price. The ERA reviewed 80-low demand trading intervals to determine what differed between these intervals and the nine trading intervals where the market did settle at the minimum STEM price.

These 80-low demand trading intervals during the review period had a final demand of less than or equal to 1,100 MW. This is less than the demand for seven of the nine trading intervals that settled at the minimum STEM price (Figure 2). None of these 80 trading intervals had a relevant forecast indicating that the balancing market would settle at the floor.

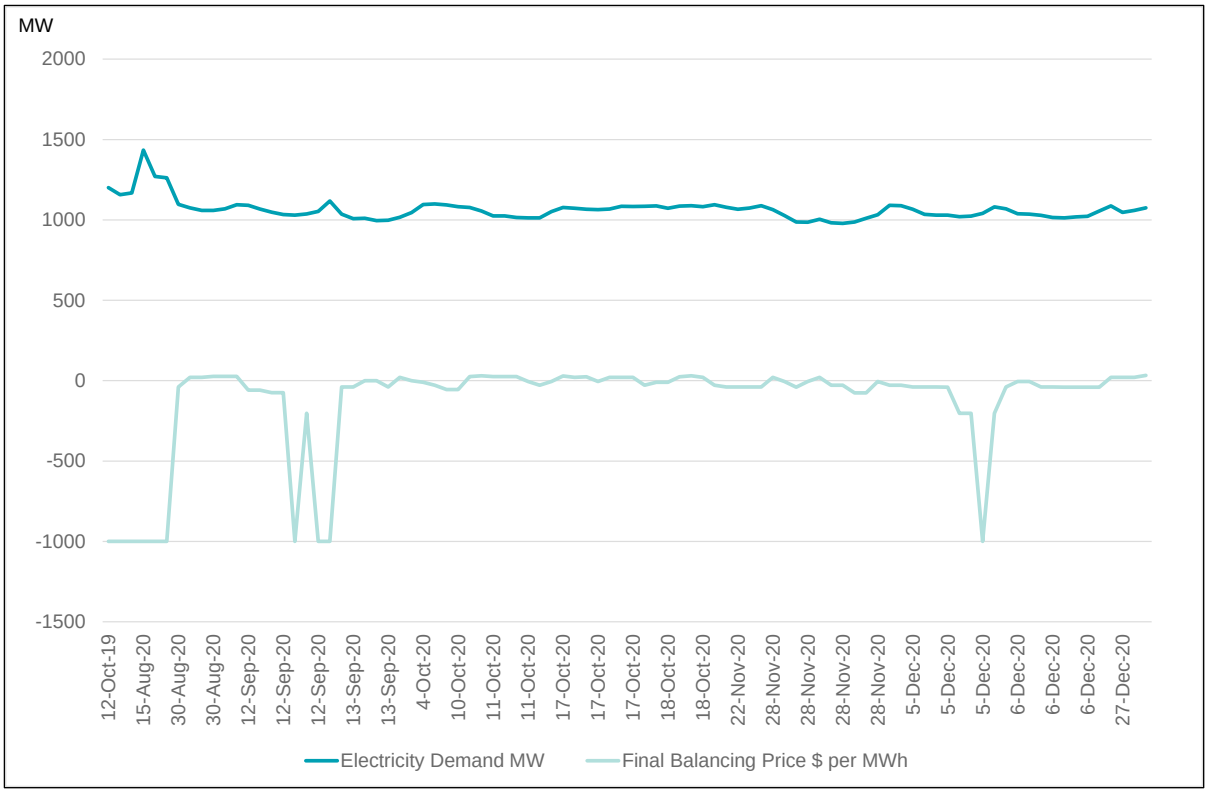
[39] Rule Change Panel, 2020, *Final Rule Change Report: Implementation of 30-Minute Balancing Gate Closure (RC_2017_02),* p. 14.

[40] Changes to gate closure was set out in Rule Change Panel, 2020, *Final Rule Change Report: Implementation of 30-Minute Balancing Gate Closure (RC_2017_02*):

- LFAS gate closure of 3.5 hours prior to the trading interval (down from 5 hours) and bid in 4-hour blocks (down for 6-hour blocks) commencing from 8:00 am.
- Balancing gate closure for Synergy of 2.5 hours prior to the trading interval (down from 4 hours) with a rolling gate closure instead of requiring Synergy to bid in trading interval blocks.
- Balancing gate closure for non-Synergy generators of 1.5 hours prior to the trading interval (down from 2 hours).

[41] The new market design is anticipated to have a gate closure of no more than 15 minutes – Energy Transformation Taskforce (Energy Policy WA), 2019, *Energy Scheduling and Dispatch Information Paper*, p. 11.

Figure 2: Final balancing price and demand for the 80 low demand intervals and -$1,000/MWh trading intervals during the review period



Source: ERA analysis of market data.

The ERA made several observations for these 80 trading intervals when compared to the nine minimum STEM price trading intervals. Only four trading intervals had quantities bid at the minimum STEM price for commissioning and these quantities were no greater than 60 MW in a single trading interval. However, during the nine trading intervals where the balancing market settled at the minimum STEM price, in all nine trading intervals quantities of up to 176 MW were offered at the minimum STEM price for commissioning activities. In addition, LFAS generators' quantities offered into the balancing market were materially lower.

Had the commissioning and LFAS quantities not been present, it is highly likely that the balancing market would have cleared above the minimum STEM price.

Since August 2020, a small number of market participants have started using the offer range between -$400/MWh and -$999.47/MWh (see Table 6 in Appendix 4). For example, Alinta's Walkaway windfarm changed its bids from -$1,000/MWh to -$999.47/MWh from October 2020 onwards.

Since September 2020, no new -$1,000/MWh trading intervals have occurred up to 30 June 2021. This is despite the SWIS experiencing new record low demand trading intervals since the end of the review period. This corresponds with the absence of commissioning quantities bid at the minimum STEM price, the change in bidding behaviour of LFAS providers and market participants using the offer range between -$400/MWh and -$999/MWh.

3.5 Conclusion

The ERA's conclusion is that a surplus of bids at the minimum STEM price led to the balancing price settling at the minimum STEM price for the nine trading intervals during the review period. This surplus was due the large quantities of electricity offered by ancillary services generators and for commissioning activities at the minimum STEM price.

Therefore, the ERA's conclusion for this criterion is that, for all nine trading intervals during the review period, the reason for the market not settling at the minimum STEM price was not because the price was too high.

4. Criterion 2 - AEMO's dispatch

The ERA is required to consider trading intervals where AEMO dispatched generators down because the minimum STEM price was too high:

> 6.20.14. In determining whether the Minimum STEM Price is appropriate under clause 6.20.13(a), subject to clause 1.35.2, the Economic Regulation Authority must consider without limitation, if since the last annual review of the Minimum STEM Price under clause 6.20.13:
>
> …
>
> (b) AEMO dispatched a Facility below the sum of all quantities priced at the Minimum STEM Price in the relevant Forecast Balancing Merit Order, for reasons other than Downwards Out of Merit dispatch and dispatch of LFAS or other Ancillary Services, because, in the Economic Regulation Authority's reasonable opinion, the Minimum STEM Price was too high;

Clause 6.20.14(b) requires the ERA to consider trading intervals where there was a forecast oversupply of electricity priced at the minimum STEM price that required AEMO to dispatch down a generator priced at the floor because another generator could not decommit.[42] The ERA does not need to consider trading intervals where generators were dispatched down out of merit or dispatched in connection with the provision of ancillary services.

To analyse this criterion, the ERA has:

1. Identified each trading interval where the balancing market was forecast to settle, or settled, at the minimum STEM price.

2. For each of these trading intervals, identified where AEMO dispatched a generator below the sum of all the MW quantities priced at the minimum STEM price.

3. Where AEMO dispatched a generator below the MW quantities priced at the minimum STEM price, considered why this occurred and whether it was because the minimum STEM price was too high.

The ERA has not published the actual dispatch data in its analysis because this information is confidential under the WEM Rules. Instead, the ERA has published representative examples of AEMO's dispatch where relevant.

4.1 Balancing market dispatch process

Market generators submit price and quantity offers into the WEM's balancing market to supply electricity for each 30-minute trading interval. These offers are called balancing submissions.

AEMO arranges the balancing submissions in ascending price order to create a forecast balancing merit order for each trading interval. In general, AEMO is required to dispatch in accordance with the forecast balancing merit order quantities.[43] AEMO uses electricity demand forecasts and intermittent generator data for each trading interval to determine which facilities in the forecast balancing merit order will be dispatched.

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[42] Clause 6.20.14(b) refers to the term Downwards Out of Merit dispatch. This not a defined term in the WEM Rules. The ERA has interpreted this term to mean occurrences where AEMO dispatched a generator downwards for a quantity different to that specified in the forecast balancing merit order. This is consistent with the out of merit definition in the WEM Rules referred to earlier.

[43] When the SWIS is in a high-risk operating state, for example, AEMO can dispatch generators out of merit order to ensure system security.

The last forecast balancing merit order for a trading interval is published approximately 30 minutes before that trading interval commences.[44] AEMO calculates the quantities required for generation and issues dispatch instructions to each market participant. Dispatch instructions are issued prior to the commencement of the trading interval for generators to respond so that the expected quantity of electricity will be generated by the end of the trading interval. AEMO calculates the quantities for these dispatch instructions approximately 10 to 15 minutes before the trading interval commences using the most recent available data which includes forecast demand and intermittent generator output.[45] AEMO may continue to issue dispatch instructions to generators after the commencement of the trading interval in response to updated forecast information.

AEMO's dispatch instructions for a trading interval may deviate from the forecast balancing merit order quantities for that trading interval. This may occur due to changes in forecast demand, fluctuations in renewable generation output and/or generator outages after the forecast balancing merit order is determined. For example, at the time AEMO calculates the dispatch quantities (around 10 to 15 minutes before the relevant trading interval), if the latest forecast electricity demand is lower than the previous demand forecast (approximately 30 minutes before the relevant trading interval) then less generation is needed. In these circumstances, AEMO's dispatch quantities for that relevant trading interval will be different to the quantities indicated in the last forecast balancing merit order.

Clause 6.20.14(b) requires the ERA to consider trading intervals where the balancing price was forecast to settle at the minimum STEM price and AEMO dispatched a generator for a quantity less than its forecast cleared quantity because the minimum STEM price was too high. Downward dispatch instructions in response to falling demand are not due to the level of the minimum STEM price and the ERA has taken this into account when assessing relevant trading intervals where AEMO issued downwards dispatch instructions.

AEMO may be required to dispatch down a generator because the minimum STEM price is too high when there are several generators tied at that price but not all their quantities are required to meet the forecast demand. Where there is excess supply at the minimum STEM price, a tie-break process determines which generators priced at the floor will remain on and which generators will get dispatched down based on their random number assignment, rather than a competitive market outcome.[46] This random outcome may require AEMO to manually intervene in the dispatch process to ensure that a conventional generator remains on, and AEMO must therefore dispatch another generator to a lower quantity. The ERA has assessed whether there were any trading intervals of this kind in the review period.

4.2 Relevant trading intervals

To assess clause 6.20.14(b), the ERA considered each trading interval where the balancing market was forecast to settle at the minimum STEM price at the time the last forecast for that trading interval was generated (approximately 30-minutes before the trading interval). The ERA also examined trading intervals where the balancing market settled at the minimum STEM price. These intervals are shown in Table 2.

[44] Australian Energy Market Operator, 2019, *Market Procedure: Balancing Market Forecast*, p 7.

[45] A dispatch instruction is an instruction issued by AEMO to a generation or demand side facility, other than Synergy in respect of its balancing portfolio, directing that facility to vary output or consumption.

[46] It is possible for offers to be tied in the balancing merit order. To determine the order of these tied quantities in the balancing merit order, AEMO assigns a random number each day to each balancing facility, referred to as the tie-break process or methodology – Australian Energy Market Operator, 2019, *Market Procedure: Balancing Market Forecast*, pp. 10-11.

Table 2: Relevant trading intervals when forecast and/or final balancing price was equal to minimum STEM price

Trading interval	Forecast price ($/MWh)	Forecast demand (MW)	Final balancing price ($/MWh)	Final demand (MW)	Category[47]
12 October 2019 1:00pm	-213.65	1,203	-1,000	1,200	A
13 October 2019 12:00pm	-9.94	1,246	-1,000	1,157	A
13 October 2019 1:00pm	-195.98	1,205	-1,000	1,167	B
15 August 2020 10:00am	-202.41	1,512	-1,000	1,435	B
15 August 2020 11:30am	-1,000	1,241	-1,000	1,270	B
15 August 2020 12:00pm	-1,000	1,264	-1,000	1,262	B
12 September 2020 12:30pm	-59.06	1,083	-1,000	1,030	B
12 September 2020 1:30pm	-38.97	1,119	-1,000	1,053	B
12 September 2020 2:00pm	-59.06	1,176	-1,000	1,118	B
13 September 2020 10:30am	-1,000	1,047	-38.88	1,036	C
13 September 2020 1:30pm	-1,000	999	0.01	1,045	C
13 September 2020 2:00pm	-1,000	1,068	-5.09	1,108	C
17 September 2020 12:00pm	-1,000	1,261	26.37	1,247	C
17 September 2020 12:30pm	-1,000	1,231	-202.41	1,242	C
17 September 2020 1:00pm	-1,000	1,212	20.74	1,259	C
5 November 2020 8:30am	-1,000	1,361	175.12	1,383	C

[47] The trading intervals have been categorised as A, B, or C to assist the analysis in sections 4.3 and 4.4. Categories A and B are trading intervals when the market settled at the minimum STEM price. Category A refers to trading intervals when AEMO dispatched up generators for quantities greater than the amount the forecast balancing merit orders indicated were required. Category B refers to trading intervals when AEMO dispatched down generators that were in merit, for amounts lower than the values the forecast balancing merit orders indicated were required from these facilities. Category C refers to trading intervals that were forecast to settle at the minimum STEM price 30 minutes before the trading interval, but the final balancing prices settled at prices higher than the minimum STEM price.

Trading interval	Forecast price ($/MWh)	Forecast demand (MW)	Final balancing price ($/MWh)	Final demand (MW)	Category[47]
5 November 2020 9:30am	-1,000	1,266	24.83	1,260	C
5 November 2020 10:00am	-1,000	1,239	29.42	1,245	C
5 November 2020 10:30am	-1,000	1,275	43.84	1,243	C

Source: ERA analysis of market data.

4.3 Observations for the relevant trading intervals

The ERA reviewed the dispatch instructions for the 10 category C trading intervals in Table 2. Category C refers to trading intervals that were forecast to settle at the minimum STEM price but actually cleared above the minimum STEM price (Table 2).

For the 12:30pm 17 September 2020 trading interval, AEMO dispatched three generators (including the forecast marginal generator) priced at the minimum STEM price below their forecast balancing merit order cleared quantities.[48] Since the final demand for this trading interval was slightly higher when compared to the forecasted demand, the ERA reviewed this interval to consider why these generators were dispatched for the lesser quantities.

While AEMO initially dispatched down the marginal and two other generators before the commencement of the trading interval, it subsequently dispatched up all three generators during the interval to meet rising demand. The ERA's observation is that the changes in electricity demand that occurred after the determination of the forecast balancing merit order led to the initial lower dispatch instructions. The lower dispatch instructions were not because the minimum STEM price was too high.

For the other category C trading intervals, AEMO's dispatch instructions and Synergy's dispatch were consistent with the forecast balancing merit order.[49]

The ERA reviewed the nine intervals (categories A and B in Table 2) where the balancing market settled at the minimum STEM price.

For two of the nine trading intervals (category A) when the balancing price settled at the minimum STEM price, AEMO dispatched up the two forecast marginal units for quantities greater than the amount that forecast balancing merit orders indicated were required. The upward dispatch of these facilities is not within the scope of this criterion.[50] None of the

[48] Two intermittent generators were consistently dispatched down at a smaller amount (less than 1 MW) than the amount they were cleared for in the forecast balancing merit order across the 10 (category C) trading intervals. The dispatch instruction values were equivalent to the facility's maximum capacity amount. The dispatch deviations were considered of no consequence to this analysis given the small deviation.

[49] Synergy bids as a portfolio and does not receive dispatch instructions. The ERA compared the forecast balancing merit order, the final balancing merit order and the average energy produced by Synergy during all the trading intervals that were forecast to settle at or did settle at the minimum STEM price to analyse if AEMO dispatched down the Synergy portfolio.

[50] Clause 6.20.14(b) of the WEM Rule refers to downwards dispatch only, which for this criterion is the dispatch of a generator below the sum of the Megawatt quantities at the minimum STEM price.

remaining generators priced at the minimum STEM price were dispatched down for these two trading intervals.

For the remaining seven trading intervals (category B), AEMO dispatched some facilities that were in merit, including the forecast marginal unit, for amounts lower than what the forecast balancing merit order indicated was required from these generators.

For six of those seven trading intervals, electricity demand was falling. For these six trading intervals, the ERA's preliminary finding was that falling electricity demand led to these downwards dispatch instructions.

In the remaining interval (11:30am 15 August 2020) final demand was higher than forecast demand. While AEMO initially dispatched down the marginal generator before the commencement of the trading interval, it was subsequently dispatched up during the trading interval to meet rising demand. The ERA's preliminary finding is that changes in electricity demand led to these dispatch instructions being issued.

4.4 Stakeholder submissions

All four submissions (Alinta Energy, Bluewaters Power, NewGen Power Kwinana and Synergy) agreed with the ERA's analysis presented in the ERA's issues paper.

Some submitters considered that the minimum STEM price should be higher (also refer to section 7.2). However, if the minimum STEM price is set too high this may require AEMO to dispatch down generators in the manner referred to in criterion 2. This could occur because of the tie-break process that determines which generators priced at the minimum STEM price will remain on, and which generators will be dispatched off.[51] The tie-break process results in a random order dispatch outcome, rather than a competitive market outcome. This situation may require AEMO to manually intervene in the dispatch process. For example, for the October 2019 trading intervals where the balancing market settled at the minimum STEM price, AEMO stated:

> Generation that is offered at the Minimum STEM Price is ordered in accordance with the tie-break methodology which allocates a random order to all facilities, to apply for the Trading Day. As a result of this methodology the Bluewaters Unit 1, a 229 MW coal generation facility, was the marginal unit on both 12 and 13 October and was dispatched down to accommodate the low operational demand ….
>
> If demand had dropped a further 100 MW between the 12:00 and 1:00 Trading Intervals, Bluewaters Unit 1 would have been dispatched below its minimum stable generation level and therefore would have been de-committed. Large synchronous generators, such as Bluewaters Unit 1, inherently provide voltage support and inertia. AEMO must monitor this and may be required to take action in response to the potential de-commitment of a large synchronous generator when demand is low.[52]

If there was a materially higher minimum STEM price, analysis of criterion 2 in the future may lead to the conclusion that the minimum STEM price is not appropriate should there be trading intervals where AEMO needed to intervene with normal dispatch as described above.

[51] To determine the order of tied quantities in the balancing merit order, AEMO assigns a random number each day to each balancing facility, referred to as the tie-break process or methodology – Australian Energy Market Operator, 2019, *Market Procedure: Balancing Market Forecast*, pp. 10-11.

[52] Australian Energy Market Operator, 2020, *Quarterly Energy Dynamics Q4 2019,* p.39.

4.5 Further analysis

The analysis presented in the ERA's issues paper used forecast demand and intermittent generation data available to market participants approximately 30 minutes before the relevant trading interval. However, AEMO uses the latest available forecast demand and intermittent generation data when calculating dispatch instruction quantities ten minutes before the trading interval. This data is likely to be different to the data available 30 minutes before the trading interval. The ERA therefore considered it appropriate to examine this latest available data to support its earlier analysis.

AEMO provided more granular forecast demand and intermittent generation data to assist the ERA with its further analysis of the eight trading intervals over the review period where AEMO dispatched a generator for amounts lower than specified in the forecast balancing merit order. The eight trading intervals consist of all seven category B trading intervals in Table 2 and the 17 September 2020 12:30pm trading interval, also in Table 2.

The example in Table 3 illustrates how the ERA used the data provided by AEMO to assess whether AEMO dispatched down a generator due to fluctuations in intermittent generator output and forecast demand or because the minimum STEM price was too high. The following example is representative of the eight trading intervals.

Table 3: Electricity demand and dispatch instructions for trading interval 15 August 2020 1:00pm

Generator name	Forecast quantity at 12:30pm (MW)	Actual dispatch instruction issued at 12:50pm (MW)[53]	Actual dispatch instruction issued at 1:05pm (MW)[54]	Actual dispatch instruction issued at 1:15pm (MW)[55]
Other generators	1,027	1,027	1,027	1,027
Solar farm B	130	115	130	130
Windfarm A	70	0	36	55
Forecast electricity demand for end of trading interval	**1,227**	**1,142**	**1,193**	**1,212**

Source: Example based on ERA analysis of market data.

Table 3 shows that the intermittent generator, Windfarm A, is the marginal unit at the time that the forecast balancing merit order is produced for the 1:00pm trading interval (at 12:30pm). At 12:50pm, when AEMO calculates the first dispatch instruction quantities for the 1:00pm trading interval, forecast demand has fallen and Windfarm A no longer needs to be dispatched and Solar farm B also needs to be dispatched for a lower quantity than earlier forecast. For the remaining dispatch times in the 1:00pm trading interval, Windfarm A is the marginal unit and receives dispatch instructions according to changes in forecast demand at 1:05pm and 1:15pm. All these forecasts are lower than the initial forecast at 12:30pm. This means that less

[53] The 12:50pm dispatch instruction has a response time of 13:00pm.

[54] The 1:05pm intra-interval dispatch instruction has a response time of 1.15pm.

[55] The 1.15pm intra-interval dispatch instruction has a response time of 1.20pm.

energy was required to be dispatched to meet demand than the amount originally forecasted in the balancing merit order.

The ERA's further analysis confirms its earlier analysis that the changes in electricity demand led to AEMO's downward dispatch instructions being issued.

4.6 Consultation with AEMO

The ERA consulted with AEMO on its analysis of the 19 trading intervals that either were forecast to settle or settled at the minimum STEM price. AEMO confirmed the ERA's observations and preliminary findings and informed the ERA that its dispatch decisions are guided by demand and power system security rather than the minimum STEM price being too high.[56]

4.7 Conclusion

The ERA's analysis of the 19 trading intervals where the final balancing price either settled at or was forecast to settle at the minimum STEM price, in conjunction with consultation with AEMO, confirms that there were no intervals where AEMO dispatched a generator down because the minimum STEM price was too high. Instead, the reasons for AEMO's downward dispatch in the analysed trading intervals were due to changes in forecast demand and changes to intermittent generator output that required other generators to be dispatched down accordingly.

The ERA's conclusion for this criterion is that there were no trading intervals during the review period where AEMO dispatched down a generator priced at the floor because the minimum STEM price was too high.

[56] When discussing the market data used for the analysis, AEMO informed the ERA that there may be cases where the reason for differences between dispatch instructions and balancing merit order quantities may be more difficult to identify. For example, there may be differences due to the dispatch of LFAS facilities, but this may not necessarily be obvious from the available data. These matters did not affect the outcome of the ERA's analysis.

5. Criterion 3 - Changes in the generation fleet

The ERA must assess changes in the generation fleet and determine whether the current minimum STEM price is too high or too low to allow the balancing market to clear above the minimum STEM price in most circumstances.[57] The scope of this criterion is defined in clause 6.20.14(c) of the WEM Rules:[58]

> 6.20.14. In determining whether the Minimum STEM Price is appropriate under clause 6.20.13(a), subject to clause 1.35.2, the Economic Regulation Authority must consider without limitation, if since the last annual review of the Minimum STEM Price under clause 6.20.13:
>
> …
>
> (c) there has been a change in the generation fleet in the SWIS, that, in the Economic Regulation Authority's reasonable opinion, is likely to result in:
>
> i. the current Minimum STEM Price being materially lower than necessary to achieve the criterion in clause 6.20.16(a), including but not limited to an upgrade or the retirement of a Facility with high cycling costs; or
>
> ii. the current Minimum STEM Price being too high to achieve the criterion in clause 6.20.16(a), including but not limited to the increase of cycling costs due to deterioration or aging of an existing plant.

To determine whether there were changes in the generation fleet during the review period that would indicate that the minimum STEM price was too high or too low, the ERA:

1. Identified changes to the generation fleet over the review period, which included assessing new entrants, plant retirements and upgrades to or reported deterioration of generators.

2. Assessed whether these changes altered the cycling costs for the relevant generators such that the current minimum STEM price is no longer appropriate.[59, 60, 61]

5.1 Generator cycling costs

A generator's cycling costs are the costs that a generator incurs to shut down and restart a generator. These costs are derived from considering:[62]

- The cost of fuel, variable operating costs and maintenance costs.
- The time the generator takes to shut down, time it must remain out of service before it can be restarted and the time it takes for the generator to ramp back up to a minimum stable level of generation.

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57 Wholesale Electricity Market Rules (WA), 1 February 2021, Rules 6.20.14(c) and 6.20.16(a)

58 Ibid, Rule 6.20.14(c)

59 For the ERA's determination on whether the minimum STEM price is appropriate, the set of 'relevant generators' are those generators with high cycling costs that generally bid some of their electricity at the minimum STEM price. These are predominantly base load coal fired generators.

60 Cycling costs include start-up and shut down costs, any expected losses or gains, opportunity costs and cost savings. Wholesale Electricity Market Rules (WA), 1 February 2021, Rule 6.20.19

61 For example, where a high cycling cost generator's costs have gone down but another high cycling cost generator's costs have gone up, the ERA's assessment will consider how those generators' changing costs will affect the amount of electricity that is likely to be bid by those generators at the minimum STEM price.

62 Wholesale Electricity Market Rules (WA), 1 February 2021, Rule 6.20.19

- Opportunity costs that a generator would incur during these shut down and restart times (for example, unearned revenue due to the generator being shut down) and any associated cost savings.

A generator's cycling costs will influence a market participant's bidding behaviour, particularly the amount of electricity bid at the minimum STEM price. Generators may price some of their electricity at the minimum STEM price even when forecast prices are low as the cycling costs of shutting down a generator can be substantial. For example:

> The opportunity costs of forcing a plant below mingen will include not only the immediate costs associated with taking the plant offline but also the cost of starting the plant up again when it is required.[63] The time that it takes to have such a plant come back into operation can be considerable. If this causes the plant to be unavailable when it is needed there will be an additional opportunity cost associated with lost revenue in future trading intervals while the plant is lying idle. In other words, while within the trading interval it may be cheaper to shut a plant down than to run the plant, it may not be the best decision over the trading day. Therefore, the impact on cost in future trading intervals must be considered in the current decision. For this reason, and for reasons of security and reliability, coal fired plants are, ideally, only shut down for scheduled maintenance.[64]

If generators with high cycling costs experience material changes to their cycling costs, then the current minimum STEM price may not be appropriate. For example, if a generator is upgraded, which reduces the cost and/or time that generator takes to shut down and restart, then during low-demand trading intervals the generator may be willing to bid at a higher price than the current minimum STEM price. If this happens to generators with high cycling costs which bid at the minimum STEM price, the minimum STEM price may be unnecessarily low. Conversely, if cycling costs for relevant generators have increased (for example, due to an increase in start-up and shut-down costs), then the current minimum STEM price may be set too high, as generators cannot bid low enough to differentiate their willingness to shut down. This could lead to the balancing price settling at the minimum STEM price more often.

5.2 Method for assessing changes to the generation fleet

The state of the generation fleet at the beginning of the review period, 1 October 2019, was used as the reference point for assessing changes to the fleet up to 31 January 2021, the end of the review period.

The ERA's method for assessing this criterion, as stated in the issues paper, was to consider whether there had been material changes to generator cycling costs – that is, shutdown and restart costs and the associated shutdown, offline and restart times, during the review period.

The ERA examined the relevant generators (those with high cycling costs) that typically bid some of their electricity at the minimum STEM price over the review period and if there had been changes to their cycling costs.

The ERA also considered new generators that were added to the SWIS during the review period and whether these new generators had high cycling costs that were relevant to the assessment of this criterion.

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63 To avoid costly damage to steam turbines associated with expansion and contraction, venting steam at low demand is not an option for most base-load plants. If this were technologically feasible, it would be cheaper to operate a coal fired based-load plant at minimum generation and vent steam during periods of low demand for electricity rather than shut it down.

64 Economic Regulation Authority, 2008, *Portfolio Short Run Marginal Cost of Electricity Supply in Half Hour Trading Intervals – Technical Paper,* pp. 16-17.

5.3 Stakeholder submissions

All submissions (Alinta Energy, Bluewaters Power, NewGen Power Kwinana and Synergy) agreed with the ERA's method for assessing changes to the generation fleet in the SWIS as proposed in the issues paper.[65]

Further, Alinta also commented on the ERA's statement in the issues paper that the addition of renewable generation does not necessarily lead to a direct change in the cycling costs of relevant generators. This is discussed further in section 5.5.

The issues paper provided an opportunity for stakeholders to provide further information on generator cycling costs to assist the ERA's review under this criterion. While updated information was provided by one stakeholder, it did not show a change in the cycling costs of the relevant generators for the review period.

5.4 Further analysis

During the review period the ERA received updated information from a small number of generators and further information from one submitter in response to the ERA's issues paper as stated in section 5.3. Most of the generators with high cycling costs have not reported any change to their costs. The ERA's conclusion is that there has not been a material change in the generation fleet that is likely to mean the minimum STEM price is too high or too low because the set of generators with the highest cycling costs have remained largely unchanged during the review period.

5.5 Additional generation in the SWIS

A total of 622 MW of new generation capacity connected to the SWIS during the review period, consisting entirely of renewable generators. Renewable generators are willing to be dispatched at negative prices as they can receive renewable subsidies and may have contractual incentives to sell their energy into the balancing market.[66] Additionally, since cycling costs for renewable generators tend to be significantly lower than for traditional base load generators, renewable generators are not bidding at negative prices to avoid cycling costs. Therefore, this additional 622 MW of new renewable generation capacity is not directly relevant to the assessment of changes to the generation fleet under the clause 6.20.14(c) criterion of the WEM Rules.

However, renewable generation can increase the cycling costs of base load generators by requiring these base load generators to change the amount of electricity they generate frequently, which can result in more wear and tear that, for example, may increase the need for maintenance.[67] Consequently, cycling costs could increase for these generators which would be assessed under this criterion. However, the entry of renewable generation capacity was recent and no updated information has been received from relevant generators that

[65] Economic Regulation Authority, 2021, *Minimum STEM price review 2021 – Issues paper and preliminary findings,* pp. 19-21.

[66] An example of these incentives is the Renewable Energy Certificates that are an alternative energy revenue source for renewable generators.

[67] Since renewable generation has little marginal costs to generate electricity, large amounts can be bid at the minimum STEM price to ensure that those units are dispatched. This can displace base load plants that would have generated more had the renewable generators not bid at the minimum STEM price. This then forces those generators to change output more often rather than running at a constant output which increases wear and tear on the plant.

shows increased cycling costs due to the entry of more renewable capacity.[68] Alinta's submission stated that, if the entry of renewable generation did affect cycling costs of some generators, it would expect minimum STEM price trading intervals to occur more often.[69]

5.6 New technologies

This review is occurring while the WEM is evolving and new technologies such as storage seek to enter the market, as evidenced by Synergy's and Alinta's announcements to build batteries in the SWIS.[70,71] The likely effect of storage is to lessen the dips and peaks of electricity demand and supply during the day. Storage could decrease the likelihood of minimum STEM price trading intervals occurring because the more negative the electricity price, the greater the incentive to store that electricity. The addition of storage technology will not affect the assessment of the minimum STEM price in this review because these technologies will not be operational until September 2022 at the earliest, but it may need to be considered in future reviews.[72]

5.7 Conclusion

There has been no change in relevant generator cycling costs over the review period.[73] Therefore, the ERA's conclusion for this criterion is that there has not been a change in the generation fleet that indicates that the current minimum STEM price is too high or too low.

68 Most of the generators with high cycling costs did not report a change to their shutdown or restart costs or their shutdown, offline and restart times during the review period. Also, the ERA observed that over 2017-18, the increasing penetration of rooftop solar did not materially change base load generator run times that would have resulted in an increase to balancing market bids and prices. – Economic Regulation Authority, 2019, *Report to the Minister for Energy on the Effectiveness of the Wholesale Electricity Market 2018*, pp. 8-9.

69 Alinta Energy, Submission to *Minimum STEM price review 2021 – Issues paper and preliminary findings,* p. 3.

70 Renew Economy, 'West Australia to build 100MW big battery – the first on state's main grid', (online) [accessed 18 May 2021]. Synergy's battery is expected around September 2022.

71 Renew Economy, 'Alinta to build second big battery in WA grid, next to Alcoa alumina plant' (online) [accessed 18 May 2021]. Alinta's battery is expected around March 2023.

72 Storage technology may be considered in future reviews when assessing clause 6.20.14(a) criterion - Wholesale Electricity Market Rules (WA), 1 February 2021, Rule 6.20.14(a) and Government of Western Australia, 'Big battery to power 160,000 homes in WA and create 100 local jobs', (online) [accessed 23 May 2021]

73 Due to the confidentiality of short run marginal cost data (which includes start-up and shutdown costs), this information cannot be published.

6. Summary of conclusions for mandatory criteria 1 to 3

The ERA's conclusions for each mandatory criterion are:[74]

Criterion 1 - Trading intervals when the balancing market settled at the minimum STEM price (Chapter 3).

The balancing market settled at the minimum STEM price in nine trading intervals in the review period for reasons other than because the price was too high. The main factors that led to the balancing market settling at the minimum STEM price in all nine trading intervals was the large quantity of electricity offered by ancillary services generators and for commissioning activities at the minimum STEM price. This created a surplus of cheaply priced electricity.

Criterion 2 - AEMO's dispatch (Chapter 4).

There were 19 trading intervals in the review period that were either forecast to settle or settled at the minimum STEM price. AEMO dispatched generators downwards in eight of these trading intervals. The reasons AEMO dispatched generators downwards were due to changes in forecast demand and renewable generation output and not due to the minimum STEM price being too high.

Criterion 3 - Changes in the generation fleet (Chapter 5).

Most generators with high cycling costs that typically bid at the minimum STEM price have not reported a change to their cycling costs over the review period. This is despite 622 MW of renewable generation capacity joining the SWIS during the review period. There has not been a change to the generation fleet over the review period that indicates that the current minimum STEM price is too high or too low.

The ERA concludes that none of the mandatory criteria indicate that the minimum STEM price is too low or too high.

[74] Wholesale Electricity Market Rules (WA), 1 February 2021, Rule 6.20.14

7. Requirements of the minimum STEM price

To determine whether the minimum STEM price is appropriate, the ERA must consider whether the analysis of the mandatory criteria in clause 6.20.14 (referred to as criterions 1 to 4 in this report) along with the information provided by market participants is enough to conclude that the minimum STEM price is achieving the requirements in the WEM Rules:

> 6.20.16 The Minimum STEM Price must:
>
> (a) allow clearance of the Balancing Market without the Balancing Price being equal to the Minimum STEM Price in most circumstances; and
>
> (b) subject to clause 6.20.16(a), limit Market Participants' exposure to Balancing Prices that would threaten the financial viability of a prudent Market Participant.

7.1 Clause 6.20.16(a) - allow the balancing market to clear above the minimum STEM price in most circumstances

The WEM Rules state that the minimum STEM price must allow the balancing market to clear above the minimum STEM price in most circumstances. If the balancing price is settling at the minimum STEM price frequently, this may indicate that the minimum STEM price may not be appropriate.

During the review period the balancing market settled above the minimum STEM price 99.96 per cent of the time. As this is the ERA's first review of the minimum STEM price, there are no other review periods to compare this review against. Despite this, 99.96 per cent of the time is fractionally less than all of the time and the ERA's conclusion is that, in the absence of comparative review periods, this indicates that the market settled above the minimum STEM price in most circumstances during the review period.

However, Synergy submitted that setting the minimum STEM price at a higher level (-$250/MWh) would still allow the market to clear above the floor price in most circumstances. Analysis of the trading intervals in the review period shows that the balancing market would have settled less often at -$1,000/MWh (nine times in the review period) than at any other higher price (at least 11 times in the review period for prices between -$200/MWh and -$999.47/MWh). This is partly because more generators have started bidding between -$200/MWh and -$1,000/MWh. In these circumstances, more minimum STEM price trading intervals would have occurred if the minimum STEM price was higher than -$1,000/MWh. This outcome is not consistent with the clause 6.20.16(a) requirement.

Additionally, the balancing market may settle more often in future at a higher minimum STEM price of -250/MWh. This is because the higher floor price reduces the financial risk for generators and may encourage generators to bid greater quantities at this level. The quantities offered at the higher minimum STEM price will come from generators currently bidding at and between -$1,000/MWh and -250/MWh, as well as any generators willing to reduce their bids to the higher minimum STEM price of -$250/MWh. If the balancing market settles frequently at this higher minimum STEM price, then this would be inconsistent with the objective to allow the balancing market to clear above the minimum STEM price in most circumstances.

7.2 Clause 6.20.16(b) – Exposure that threatens a participant's financial viability

The second requirement of the minimum STEM price is (clause 6.20.16(b)):

> (b) subject to clause 6.20.16(a), limit Market Participants' exposure to Balancing Prices that would threaten the financial viability of a prudent Market Participant.

Bluewaters, NewGen Power Kwinana and Synergy submitted that the current minimum STEM price exposed market participants, particularly providers of ancillary services, to a higher level of financial risk than if the minimum STEM price was higher, and therefore did not meet the objective in clause 6.20.16(b).[75] The ERA acknowledges the current WEM design requires ancillary service providers to offer quantities at the minimum STEM Price, but changes to the WEM design are not within scope of this review. However, changes to the design of the WEM from the Government's Energy Transformation Strategy will mitigate these concerns through the introduction of co-optimised energy and ancillary services markets in the future.

A higher minimum STEM price may limit the extent that market participants are financially exposed, but the clause 6.20.16(b) requirement is that a market participant's financial exposure must threaten the financial viability of a prudent market participant.

Sustained exposure to the minimum STEM price may threaten the financial viability of a market participant. However, the data during and since the review period shows that the balancing market rarely settled at the minimum STEM price (nine trading intervals out of 23,472 in the review period) and there is no evidence of frequent or sustained periods where the balancing market has settled at the minimum STEM price. The last time the market settled at the minimum STEM price was 12 September 2020.

The ERA's analysis presented in this report finds that the large quantities offered at the minimum STEM price from new facilities commissioning and ancillary services quantities bid at the floor price were the main factors that led to the nine floor price trading intervals during the review period, and not the level of the minimum STEM price itself. There are no prospective new generators with high cycling costs due to commission during the next review period and some ancillary services generators appear to have changed their bidding behaviour. Given these circumstances, there may not be any minimum STEM price intervals in the next review period.

Market participants did not provide any evidence to the ERA to show that their financial viability was threatened or was likely to be threatened by the current minimum STEM price. As it is rare for the balancing market to settle at the minimum STEM price, the ERA considers it unlikely that the level of the current minimum STEM price threatens participants' financial viability.

7.3 Conclusion

The ERA's conclusion for the clause 6.20.16 objectives is that the current minimum STEM price has allowed the balancing market to settle above the minimum STEM price in most circumstances in the current review period, and this is likely to continue in the next review period. The current minimum STEM price has not resulted in market participants being exposed to balancing prices that will threaten their financial viability in the current review period, nor is this likely in the next review period.

[75] This is a second order objective to be considered after the ERA concludes that the current minimum STEM price does not allow the balancing market to clear above that the floor price in most circumstances.

8. ERA's draft determination

The ERA's draft determination is that the minimum STEM price is appropriate at its current level of -$1,000/MWh. Appropriate in the context of this review means that the ERA's analysis of the review criteria under the WEM Rules, including the objectives of the minimum STEM price, do not indicate that the minimum STEM price is too high or too low.[76]

To form this draft determination, the ERA has considered the mandatory criteria in clause 6.20.14, stakeholder submissions and the objectives of the minimum STEM price in clause 6.20.16.[77]

The ERA's analysis of the criteria in clause 6.20.14 showed that:

- Factors other than the level of the minimum STEM price, such as commissioning activities and ancillary services quantities priced at the floor, led to the balancing market settling at the minimum STEM price. The balancing market did not settle at the minimum STEM price because the price was too high.
- There were no trading intervals where AEMO dispatched generators down because the minimum STEM price was too high.
- There were no material changes in the generation fleet, in particular those generators with high cycling costs, which would reasonably affect the current minimum STEM price.

The ERA's conclusion for the clause 6.20.16 objectives is that the current minimum STEM price allows the balancing market to clear above it in most circumstances. The occurrence of the balancing market settling at the minimum STEM price is likely to continue to be rare. In these circumstances, there is no evidence that the current minimum STEM price will result in market participants being exposed to balancing prices that will threaten their financial viability.

Stakeholders have six weeks to provide submissions on the ERA's draft determination.[78] The ERA will then prepare and publish its final determination.

[76] The WEM Rules require the ERA to assess the current minimum STEM price using the mandatory criteria in clause 6.20.14, the objectives of the minimum STEM price in clause 6.20.16 and any other relevant matters including stakeholder submissions.

[77] See chapter 6 for the summary of conclusions for the mandatory criteria and chapters 3 to 5 for details on each criterion.

[78] Wholesale Electricity Market Rules (WA), 1 February 2021, Rule 6.20.27

Appendix 1 List of Tables

Appendix 2 List of Figures

Appendix 3 Trading intervals when the balancing market settled at the minimum STEM price

Analysis of October 2019 trading intervals

The final balancing price settled at the minimum STEM price for three trading intervals in October 2019, shown in Table 3.

Table 3: October 2019 - Final vs AEMO's forecast balancing price and demand[79]

Trade date	Interval	Final balancing price ($/MWh)	Final demand (MW)	Forecast balancing price prior to gate closure for non-Synergy facilities ($/MWh)	Forecast demand prior to gate closure for non-Synergy facilities (MW)	Forecast balancing price prior to Synergy's gate closure ($/MWh)	Forecast demand prior to Synergy's gate closure (MW)
12 October 2019	1:00pm	-1,000	1,200.28	-1,000	1,193.67	27.96	1,314.85
13 October 2019	12:00pm	-1,000	1,157.15	-15.13	1,234.39	-15.13	1,230.93
13 October 2019	1:00pm	-1,000	1,167.29	-5.21	1,289.59	-15.13	1,247.60

Source: ERA analysis of market data.

The reasons that contributed to the market settling at the minimum STEM price were:

- **Generator bidding behaviour:** The forecast demand available to non-Synergy generators two hours ahead of the commencement of the 1:00pm 12 October 2019 trading interval indicated that the market would settle at the minimum STEM price. There was no change in generator offers prior to the offer gate closure for this interval.
  - Forecast demand of 1,234 MW and 1,289 MW was higher than the final demand of 1,157 MW and 1,167 MW for the 12:00pm and 1:00pm trading intervals respectively on 13 October 2019. Generators may not have expected the market to settle at the minimum STEM price for these two intervals and therefore made no change to their offers.
- **Ancillary service generator offers:** LFAS market offers must be submitted before balancing market offers.[80] The generators cleared to provide LFAS must offer at the minimum STEM price in the balancing market so that they can be dispatched first to comply with their LFAS offers. The WEM Rules require generators that are cleared in the LFAS market to offer their LFAS quantities (LFAS Down) along with their minimum generation quantity into the balancing market at the minimum STEM price. This ensures

[79] Synergy's Portfolio submits its balancing market offers 240 minutes (for a 6-hour bidding block) prior to the start of the trading interval, while other independent power producers (IPPs) submit their offers 120 minutes before the interval on a rolling basis. These different offer timeframes mean that there are different forecasts applicable to when Synergy is last able to submit its offers compared to when IPPs are last able to submit their offer as shown in Table 3. These arrangements were revised to shorter timeframes from 1 December 2020 onwards.

[80] The LFAS market gate closure closes before the balancing market's gate closure.

that the generator is dispatched above its minimum generation quantity plus the LFAS Down amount so that it can provide the LFAS Down service. Generators providing spinning reserve ancillary services are also required to bid their minimum generation quantities at the minimum STEM price to ensure they are dispatched and available to provide the service.

The WEM requirement for LFAS was 85 MW for the October 2019 trading intervals identified in Table 3. Four generators were cleared to provide a total 85 MW of LFAS for these trading intervals.[81]

These four generators offered their minimum generation quantities, in addition to their LFAS cleared quantities, at the minimum STEM price, totalling 435 MW (shown as light blue-coloured tranches in Figure 1 in section 3.2). There was also 153 MW submitted at the minimum STEM price by generators providing spinning reserve.

- **Coal generators:** Four coal generators totalling 410 MW offered at the minimum STEM price for the October 2019 trading intervals. [82,83] Generators with high cycling costs, such as coal facilities, decide whether to remain on during low demand periods to avoid incurring cycling costs. These generators decided to remain on. Their offers are in the light green coloured tranche in Figure 1 in section 3.2.
- **Renewable generators:** Renewable generators have an incentive to be dispatched at negative offer prices that typically reflect the value of renewable subsidies and additional benefits from selling their energy in the balancing market.[84] Renewable generators totalling 103 MW offered at the Minimum STEM Price, which is likely to have been a lower offer price than the value of these incentives.
- **Unutilised negative offer range:** The current Minimum STEM Price of -$1,000/MWh means generators can submit negative offers anywhere between $0/MWh and -$1,000/MWh to differentiate themselves from others during periods of low demand. No offers were submitted in the range between -$250/MWh and -$999/MWh for the October 2019 trading intervals in Table 3.

81 NEWGEN_KWINANA_CCG1, ALINTA_PNJ_U2, ALINTA_PNJ_U1 and PORTFOLIO (Synergy's Portfolio is treated as a single generator).

82 Muja_G5, Muja_G7, BW1_BLUEWATERS_G2 and BW2_BLUEWATERS_G1

83 The ERA assumed that some Portfolio offers at the minimum STEM price reflect coal fuelled generators.

84 An example of these incentives is the Renewable Energy Certificates that are an alternative energy revenue source for renewable generators.

Analysis of August 2020 trading intervals

The final balancing price settled at the minimum STEM price for three trading intervals in August 2020 shown in Table 4.

Table 4: August 2020 - Final vs AEMO's forecast balancing price and demand

Trade date	Interval	Final balancing price ($/MWh)	Final demand (MW)	Forecast balancing price prior to gate closure for non-Synergy facilities ($/MWh)	Forecast demand prior to gate closure for non-Synergy facilities (MW)	Forecast balancing price prior to Synergy's gate closure ($/MWh)	Forecast demand prior to Synergy's gate closure (MW)
15 August 2020	10:00am	-1,000	1,434.75	-10.08	1,716.54	-10.08	1,674.59
15 August 2020	11:30am	-1,000	1,270.06	-115.00	1,422.83	-38.97	1,499.14
15 August 2020	12:00pm	-1,000	1,261.65	-202.41	1,399.94	-38.97	1,472.43

Source: ERA analysis of market data.

The reasons that contributed to the market settling at the minimum STEM price were:

- **Generator bidding behaviour:** Forecast demand was materially higher than final demand for the three trading intervals in August 2020. Again, generators may not have expected the market to settle at the minimum STEM price for these intervals and therefore made no change to their offers.
- **Ancillary service generator offers:** Up to 355 MW was offered at the minimum STEM price by three LFAS generators, while the LFAS market requirement was 85 MW. Generators providing spinning reserve also submitted 153 MW at the minimum STEM price. The total amount of offers from ancillary services generators at the minimum STEM price ranged from 23 per cent to 37 per cent for the August trading intervals in Table 4.
- **New generators undertaking commissioning activities**: New renewable generators Merredin solar farm, Yandin windfarm and Warradarge windfarm were conducting commissioning activities in August 2020. The commissioning periods approved by AEMO for these generators coincided with low demand days.
  - The WEM Rules require generators undertaking commissioning activities to offer their electricity at the minimum STEM price to ensure that they are dispatched to perform the scheduled commissioning activities. Quantities ranging from 166 MW to 176 MW were offered by these generators at the minimum STEM price.
- **Renewable generators**: About 144 MW from renewable generators continued to be offered at the minimum STEM price.
- **Unused negative offer range:** Generators continued not to use the offer range between -$250/MWh and -$999/MWh for any of the August trading intervals in Table 4.

Analysis of September 2020 trading intervals

The final balancing price settled at the minimum STEM price for three trading intervals in September 2020 shown in Table 5.

Table 5: September 2020 - Final vs AEMO's forecast balancing price and demand

Trade date	Interval	Final balancing price ($/MWh)	Final demand (MW)	Forecast balancing price prior to gate closure for non-Synergy facilities ($/MWh)	Forecast demand prior to gate closure for non-Synergy facilities (MW)	Forecast balancing price prior to Synergy's gate closure ($/MWh)	Forecast demand prior to Synergy's gate closure (MW)
12 September 2020	12:30pm	-1,000	1,030.01	-59.06	1,088.84	-38.88	1,200.52
12 September 2020	1:30pm	-1,000	1,052.87	-38.97	1,149.93	-10.08	1,259.68
12 September 2020	2:00pm	-1,000	1,117.77	-38.97	1,206.24	-10.08	1,258.73

Source: ERA analysis of market data.

The reasons that contributed to the market settling at the minimum STEM price were:

- **Generator bidding behaviour:** Forecast demand was materially higher than the final balancing price for these three trading intervals in September 2020. Similar to two of the October 2019 trading intervals and all three August 2020 trading intervals, generators may not have expected the market to settle at the minimum STEM price and therefore made no change to their offers.
- **Ancillary service generator offers:** LFAS generator offers in the balancing market were lower (147 MW) compared to October 2019 and August 2020, but still higher than the actual LFAS market requirement of 85 MW.
- **New generators undertaking commissioning activities**: Balancing submission data showed that only one of the three new generators was actively commissioning during these three September trading intervals. However, one of the other new intermittent generators continued to offer all its electricity at the minimum STEM price.[85] This meant new generators made up to 124 MW of the quantities submitted at the Minimum STEM Price for the September trading intervals in Table 5.
- **Renewable generators**: The quantity of electricity offered by renewable generators at the minimum STEM price was higher (156 MW) than the intervals in the earlier months.
- **Unused negative offer range:** Generators continued not to use the offer range between -$250/MWh and -$999/MWh for any of the September trading intervals in Table 5.

[85] This generator may also have been undergoing commissioning but did not reflect this in its balancing submissions.

Appendix 4 Offers between -$400/MWh and -$999/MWh

Table 6: Sample of balancing market offers between -$400/MWh and -$999/MWh

Trade Date	Trading interval	Generator name	Offer MW	Offer price ($/MWh)
8 August 2020	12:00pm	SYNERGY PORTFOLIO	35.48	-537.02
8 August 2020	12:00pm	SYNERGY PORTFOLIO	1.77	-439.38
8 August 2020	12:30pm	SYNERGY PORTFOLIO	21.77	-824.50
8 August 2020	12:30pm	SYNERGY PORTFOLIO	2.23	-674.59
16 August 2020	12:30pm	SYNERGY PORTFOLIO	104.60	-900.00
16 August 2020	12:30pm	SYNERGY PORTFOLIO	2.00	-665.35
26 September 2020	12:00pm	ALINTA_WWF (windfarm)	61.40	-999.47
14 November 2020	12:30pm	ALINTA_WWF (windfarm)	42.90	-999.47
14 November 2020	12:30pm	SYNERGY PORTFOLIO	45.99	-900.00
3 January 2021	12:30pm	ALINTA_WWF (windfarm)	11.10	-999.47
3 January 2021	12:30pm	SYNERGY PORTFOLIO	11.60	-456.21

Source: ERA analysis of market data.