



Economic Regulation Authority

Minimum STEM price review 2022

Final determination report

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Executive summary

The Wholesale Electricity Market's (WEM) balancing market includes both maximum and minimum price caps.¹ The maximum price caps aim to prevent the 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 The minimum STEM price is -\$1,000 per Megawatt-hour (MWh) and has not changed since the start of the balancing market in 2012.

The Economic Regulation Authority is required to review the minimum STEM price and determine if the current price is appropriate.³

This is the ERA's second review of the minimum STEM price.⁴

The ERA's final determination, after considering the mandatory review criteria, is that the current minimum STEM price of -\$1,000/MWh meets the minimum STEM price objectives and is therefore appropriate.

To assess whether the current price is appropriate, the ERA considered the mandatory review criteria in the WEM Rules and stakeholder submissions to determine if the current price is meeting the WEM Rules' objectives (discussed below). The ERA sought comments from stakeholders in February 2022 and released a draft determination report for consultation in May 2022.

Under the WEM Rules, the objectives of the minimum STEM price are 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 compete with other generators. Conversely, if the minimum STEM price is too low then generators that must bid at the minimum STEM price, such as ancillary service providers, may be exposed to financial losses when the balancing market settles at the minimum STEM price.

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 total quantity of electricity demanded in a trading interval. This occurs when demand for electricity is low and there is a surplus of generators offering electricity at the minimum STEM price. The increased frequency

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 July 2022, 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 Following changes to the Wholesale Electricity Market Rules in August 2020, the ERA is required to review the minimum STEM price annually. The ERA completed its first review of the minimum STEM price in September 2021 and determined that the price was appropriate.

⁴ The review period spans from 1 February 2021 to 31 January 2022 but where relevant the ERA has also considered the period after this.

⁵ Wholesale Electricity Market Rules (WA), 1 July 2022, Rule 6.20.16, ([online](#))

of low demand trading intervals and record levels of low demand this review period are favourable conditions for the balancing market to settle at the minimum STEM price.⁶

However, there have been no minimum STEM price trading intervals since the last review in 2021. In the 2021 review, the balancing market settled at the minimum STEM price nine times, with the last occurring in September 2020.

Where the balancing market settles at the minimum STEM price, generators that offer at this price may be exposed to financial losses. For this 2022 review, the ERA has observed that generators are offering less quantities at the minimum STEM price when demand is forecast to be low. The ERA analysed low demand trading intervals since the last review and observed a 43 per cent reduction in the total average quantities offered at the minimum STEM price for these intervals compared to those in the previous review. This indicates that generators are no longer accepting the risk of being exposed to the minimum STEM price. This is the reason why there have been no minimum STEM price trading intervals this review period.

The ERA's assessment of the mandatory review criteria has been limited by the absence of minimum STEM price trading intervals since the last review:

- **Criterion 1: Whether the final balancing market settled at the minimum STEM price because the minimum STEM price was too high.**

There have been no trading intervals where the balancing market settled at the minimum STEM price since the last review concluded.⁷

- **Criterion 2: Whether AEMO dispatched generators down because the minimum STEM price was too high.**

When there is an oversupply of electricity from generators offering at the minimum STEM price, AEMO may need to instruct one of these generators to reduce its output if, for example, another generator could not be decommitted. This may indicate that the minimum STEM price is not low enough to allow generators to price differentiate. This criterion requires the ERA to consider trading intervals that were forecast to settle at the minimum STEM price and whether AEMO dispatched a generator/s down for any of these intervals. There were no relevant intervals where AEMO dispatched down a generator since the last review.

- **Criterion 3: Whether there have been changes to the generation fleet that makes the current minimum STEM price too high or too low.**

There have been no changes to the generation fleet that would result in the minimum STEM price being too high or too low. Since the last review, the cycling costs of the set of relevant generators did not change materially, such that the minimum STEM price would need to change.⁸

In February 2022, the ERA sought submissions from stakeholders on whether the current minimum STEM price is appropriate. Submissions from Synergy and Collgar Wind Farm stated that a higher minimum STEM price of -\$250/MWh would better meet the minimum STEM price objectives and may be more appropriate. Alinta Energy stated that the current minimum STEM price is appropriate.

⁶ For example, there were 144 trading intervals this review period where demand was less than 1,000 MW compared to seven trading intervals in the last review period. Further, minimum demand reached a new record low of 751 MW in November 2021 following the earlier record of 861 MW in October 2021.

⁷ The ERA completed its last review of the minimum STEM price on 30 September 2021.

⁸ The relevant generators are predominantly the coal generator fleet in the WEM.

The ERA released its draft determination report that the current minimum STEM price is appropriate on 31 May 2022 for stakeholder consultation. Submissions received from Alinta Energy and Shell Energy supported the ERA's draft determination that the current minimum STEM price is appropriate. Synergy stated that it understood the ERA's draft determination to not amend the current minimum STEM price but maintained its view for a higher minimum STEM price.

A higher minimum STEM price (-\$250/MWh) would reduce the financial exposure of generators and may attract more electricity to be bid at this level when compared to the current price of -\$1,000/MWh. Where there is a surplus of electricity offered at the minimum STEM price, there is greater opportunity for the balancing market to settle at the minimum STEM price frequently. This outcome would be inconsistent with the first objective to allow the balancing market to clear above the floor in most circumstances. As the balancing market has not settled frequently at the current minimum STEM price of -\$1,000/MWh, the current price is meeting the minimum STEM price's first objective, to allow the balancing market to clear above the floor in most circumstances.

The second objective of the minimum STEM price is to limit market participants' financial exposure to balancing prices that would threaten their financial viability.⁹ In the ERA's last review, there were no frequent or sustained periods where participants were financially exposed to the minimum STEM price, and since the last review, there have been no trading intervals where participants have been exposed to the minimum STEM price. In these circumstances, no evidence has been provided that demonstrated a market participant's financial viability had been, or was likely to be, threatened by the current level of the minimum STEM price.

The ERA has also considered whether declining minimum demand may lead to future minimum STEM price trading intervals. The ERA's analysis, which also considered the change in generators' risk appetite discussed above, confirms the possibility of minimum STEM price trading intervals in future. However, the frequency of these trading intervals is likely to be offset by the entrance of Synergy's new battery storage facility (100 MW capacity) and AEMO's ability to issue instructions to curtail rooftop solar generation. These factors will have a net effect of increasing demand when the battery is charging and/or rooftop solar generation is curtailed. Minimum STEM price trading intervals that occur after the conclusion of this review will be considered in the ERA's next review.

After considering the mandatory criteria and stakeholder submissions, the ERA has concluded that the current minimum STEM price is meeting its objectives to allow the balancing market to settle above it in most circumstances and does not expose participants to balancing prices that threatens their financial viability, given the rarity of minimum STEM price trading intervals.

Therefore, the minimum STEM price will remain unchanged at -\$1,000/MWh.

⁹ Wholesale Electricity Market (WEM) Rules, 1 July 2022, Rule 6.20.16(b), ([online](#))

1. Introduction

This report contains the ERA's final determination on whether the current minimum STEM price of -\$1,000MW/h is appropriate. This is the ERA's second review of the minimum STEM price. In the last review, completed in September 2021, the ERA determined that the current price met the mandatory review criteria in the WEM Rules and did not need to change.

The review must follow a two-step process:

- 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.

The review period spans from 1 February 2021 to 31 January 2022 but where relevant the ERA has also considered the period after this.

When making its determination under clause 6.20.13(a) on whether the current minimum STEM price is appropriate, the ERA must consider the mandatory review criteria specified in clause 6.20.14. This clause requires the ERA to evaluate trading intervals where the market settled at the minimum STEM price, consider AEMO's dispatch for trading intervals that were forecast to settle at the minimum STEM price and assess any changes in the generation fleet since the last review.

If the ERA concludes that the current minimum STEM price is not appropriate, the WEM Rules do not permit the ERA to choose a minimum STEM price. Instead, the ERA must follow the process in the WEM Rules for revising the minimum STEM price.¹⁰ This process includes modelling credible scenarios of low demand and determining the price at which the generator with the highest cycling costs per MW in each scenario would shut down. The WEM Rules require the ERA to determine the revised price as being the highest price determined under those scenarios that is lower than 95 per cent of the prices determined for all those scenarios.

To determine whether the minimum STEM price is appropriate, the ERA must consider the objectives of the minimum STEM price, which are to:¹¹

- 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 consider if the minimum STEM price objectives are being met, the ERA must assess the mandatory criteria in clause 6.20.14 of the WEM Rules, as well as stakeholder submissions.¹²

¹⁰ Wholesale Electricity Market Rules (WA), 1 July 2022, Rules 6.20.17 to 6.20.20, ([online](#))

¹¹ Ibid, Rule 6.20.16.

¹² Economic Regulation Authority, 'Minimum STEM price review', ([online](#)).

The ERA undertook two rounds of consultation with stakeholders to inform its 2022 determination on the minimum STEM price. In February 2022, the ERA invited stakeholders to comment on whether they considered the current minimum STEM price is appropriate. On 31 May 2022, the ERA released its draft determination report that the current minimum STEM price is appropriate for stakeholder consultation.

Chapters 3 to 5 of this final determination contain the ERA's findings and conclusions for each mandatory criterion. Chapter 6 contains an assessment of the minimum STEM price objectives. Matters raised by stakeholders are considered throughout this report.

The ERA's final determination is in chapter 8.

2. Mandatory 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:¹³

- 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.¹⁴
- 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.¹⁵ 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) since the last review, 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. During the February 2022 consultation period the ERA received submissions from three stakeholders (Alinta, Collgar and Synergy).

The ERA published its draft determination on 31 May 2022 for consultation. Submissions were received from Alinta Energy, Shell Energy and Synergy.

The ERA has considered the submissions from both consultation periods when assessing the above criteria in chapters 3 to 5, the objectives of the minimum STEM price in chapter 6 and other matters raised by stakeholders in chapter 7.¹⁶

¹³ Wholesale Electricity Market Rules (WA), 1 July 2022, Rule 6.20.14, ([online](#))

¹⁴ Ibid, Rule 6.20.14(a).

¹⁵ Ibid, Rule 6.20.14(b).

¹⁶ Submissions 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 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 assess this criterion, the ERA:

1. Considered whether there were any trading intervals during the review period where the balancing market settled at the minimum STEM price.
2. As there were no minimum STEM price trading intervals during the review period, considered the reasons why the balancing market has not settled at the minimum STEM price since the last review.

3.1 No minimum STEM price trading intervals

The balancing market will settle at the minimum STEM price when the quantity of electricity offered at the minimum STEM price is equal to or greater than the quantity of electricity demanded for that trading interval. This occurs when demand for electricity is low and there is a surplus of generators offering their electricity at the minimum STEM price.

Generators may offer electricity at the minimum STEM price for the following reasons:

- The WEM Rules require generators that are cleared in the Load Following Ancillary Services (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 that the LFAS generator is dispatched above its minimum generation quantity plus the LFAS down amount so that it can provide the LFAS down service.¹⁷
- Generators undertaking commissioning activities must also offer their electricity at the minimum STEM price to ensure that they are dispatched to perform these activities.¹⁸
- Baseload generators may seek to avoid shutting down for short periods of time so that they do not incur large shutdown and restart costs. To avoid incurring these costs, these generators may choose to bid at the floor price to ensure they are not dispatched off.
- A further commercial reason for generators to bid at the minimum STEM price may be due to physical contractual arrangements.¹⁹

¹⁷ Wholesale Electricity Market Rules (WA), 1 July 2022, Rule 7A.3.5, ([online](#))

¹⁸ Ibid, Rule 7A.2.3.

¹⁹ For example, a cogeneration plant may have a physical contractual requirement to supply steam to an industrial party where steam is a by-product of the plant's electricity production. To fulfil its contractual obligations, the

The prevalence of low demand trading intervals during the middle of the day is increasing due to the uptake of rooftop photovoltaic (PV) generation reducing midday demand.²⁰ During this review period there were 144 trading intervals where demand was less than 1,000 MW, up from seven in the previous review period.

In addition to more frequent low demand trading intervals, new record levels of low demand were set during the review period. First, a new low demand record of 860 MW was set in October 2021, followed by a further record in November 2021 of 751 MW. These records continue to be set during the shoulder period when temperatures are mild, heating and cooling needs are low, but conditions are favourable for rooftop PV generation.^{21, 22}

The increased frequency of low demand trading intervals and record levels of low demand are favourable conditions for the balancing market to settle at the minimum STEM price. However, the balancing market did not settle at the minimum STEM price during this review period. The last time the balancing market settled at the minimum STEM price was in September 2020. The lowest price the balancing market settled since the last review was -\$90.94/MWh.

Criterion 1 requires the ERA to determine if the balancing market settled at the minimum STEM price due to the minimum STEM price being too high. There are no trading intervals during this review period where the ERA needs to consider whether the balancing market settled at the minimum STEM price because the price was too high.

3.2 Reasons why the balancing market has not settled at the minimum STEM price

Despite the increased frequency of low demand trading intervals and record levels of low demand, the balancing market did not settle at the minimum STEM price during this review period. The balancing market settled at the minimum STEM price for nine trading intervals during the previous review period, 1 October 2019 to 31 January 2021. The main factors that led to the balancing market settling at the minimum STEM price during the last review were large quantities of electricity offered at that price by LFAS generators and generators undertaking commissioning activities. This created a surplus of cheaply priced electricity at the floor on low demand days.

To understand what has changed between this review period and the previous review period the ERA analysed 24 low demand trading intervals during the review period. The 24 trading intervals are a subset of the 144 trading intervals referred to in section 3.1. The 144 trading intervals occurred over 24 separate trading days in March 2021 and August 2021 to December 2021. For each of the 24 trading days, the ERA selected the trading interval with the lowest demand for analysis. The ERA compared these 24 intervals to the nine minimum STEM price trading intervals in the 2021 review period.

plant may bid at the minimum STEM price to secure dispatch to provide electricity and therefore supply steam under the contract.

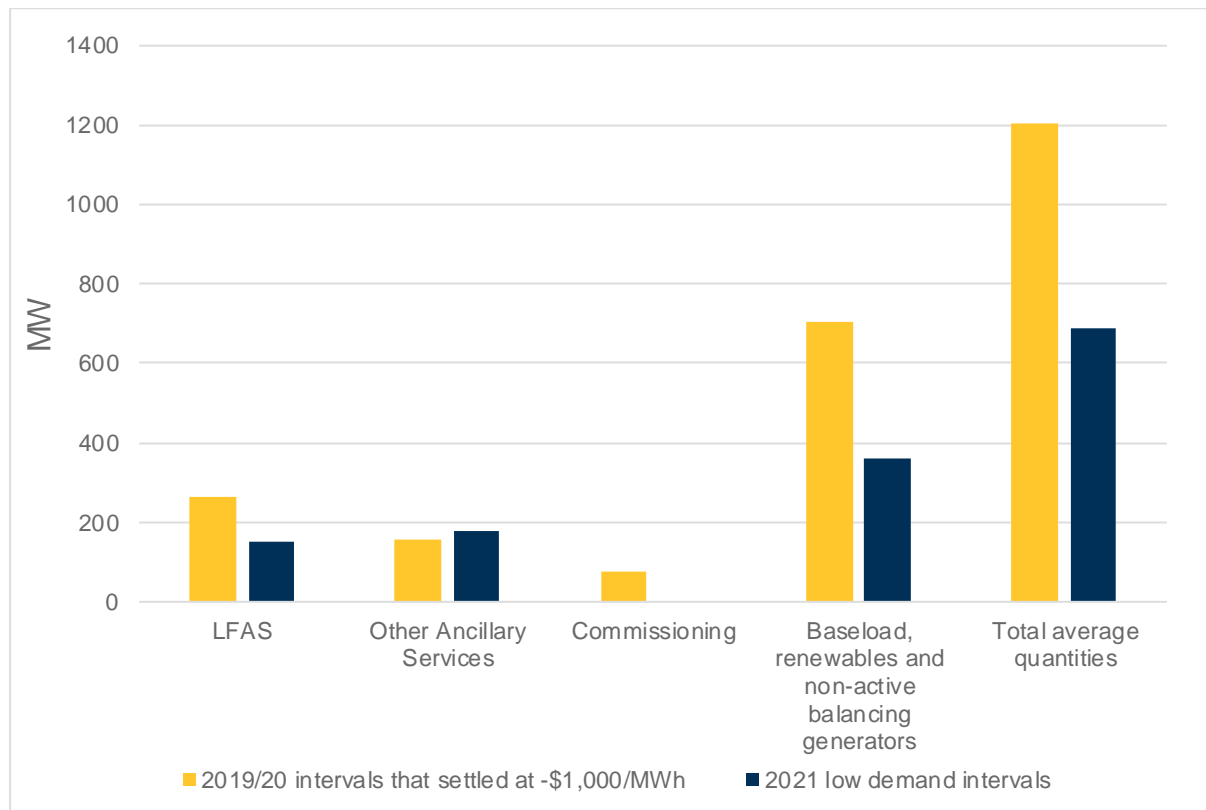
²⁰ In the ERA's 2021 Review of the minimum STEM price, there were nine trading intervals where the balancing market settled at the minimum STEM price. Demand for these intervals ranged from 1,030 MW to 1,200 MW. Given declining minimum demand as discussed in section 3.3, the ERA has chosen to use an approximation of the lower bound of this range (1,000 MW) as the upper threshold of a low demand trading interval (that is, demand below 1,000 MW is characterised as low for the purposes of this report).

²¹ Average mid-day interval rooftop PV generation reached 1,001 MW in the year 2021, compared to 797 MW in the year 2020.

²² The seasons are split into summer (Trading Months December – March), winter (Trading Months June – August), and the shoulder season, which includes all other months - AEMO's Electricity Statement of Opportunities June 2021, pg. 25, ([online](#)) [accessed 12 May 2022]

Figure 1 shows the average quantities offered at the minimum STEM price for the 24 trading intervals and compares them against the average quantities offered at the minimum STEM price during the nine floor price intervals from the previous review period.

Figure 1: Categories of average quantities offered at $-\$1,000/\text{MWh}$ in the 24 low demand intervals in 2021 compared to the nine minimum STEM price trading intervals in 2019/20



Source: ERA analysis of market data.

There was a 43 per cent reduction in the total average quantities offered at the minimum STEM price for the review period compared to the previous review period. The reduction was observed in the following generation categories:

- **LFAS down quantities:** There was a 44 per cent reduction in the average LFAS down quantities for the 24 trading intervals compared to the previous review period. The average LFAS down quantity offered into the balancing market was 150 MW, with the highest quantity offered being 277 MW.²³ The ERA observed that LFAS providers are now offering less LFAS down quantities when demand is forecast to be low.
- **Commissioning quantities:** In the ERA's last review, there was an average of 77 MW per interval at the minimum STEM price for commissioning activities in 2020 for new renewable generators. There have been no new entrants since the last review and no generators offering commissioning quantities at the minimum STEM price during the 24 low demand trading intervals.

²³ The average LFAS Down quantity offered for the nine floor price intervals was 266 MW, with the highest quantity offered being 435 MW.

- Baseload, renewable and non-active balancing facility quantities:^{24,25} There was a 49 per cent drop in the average quantity offered in this category at the minimum STEM price. The total average quantity offered from these generators during the 24 low demand trading intervals was 360 MW compared to 704 MW during the nine minimum STEM price trading intervals in the previous review period.

The balancing market commenced in 2012. The first time the market settled at the minimum STEM price was in October 2019. The balancing market settled at the floor again in August 2020 and September 2020. There have been no minimum STEM price trading intervals since.

The ERA has observed that generators are offering less quantities at the minimum STEM price when demand is forecast to be low. This indicates that generators have responded to the risk of being exposed to the minimum STEM price and are no longer accepting this risk. This change in the risk appetite of generators has led to the market settling above the floor when demand is low despite more frequent lower demand trading intervals and new record low demand levels. For the 24 trading intervals in Figure 2, the lowest price the balancing market settled at was -\$90.94/MWh with the average clearing price for these intervals being -\$31.71/MWh. This change in risk appetite appears to be a sustained change as there have been no minimum STEM price trading intervals since September 2020.

3.3 Declining minimum demand

AEMO's 2022 Electricity Statement of Opportunities (ESOO) forecasts minimum demand to decline further and reach close to 546 MW in 2022/23.²⁶ The ERA has considered whether declining minimum demand may lead to the balancing market settling at the minimum STEM price more often.

The ERA assessed this by considering the composition of the price-quantity pairs offered at the minimum STEM price for the 24 low demand trading intervals referred to in section 3.2. From this assessment, the ERA formed an approximation of the minimum non-discretionary quantities that may be offered at the floor in future low demand trading intervals. The ERA considered the change in generators' risk appetite referred to in section 3.2 and how this may affect generators offers in future should there be forecast minimum STEM price intervals. The ERA made the following assumptions:

- To avoid the cost of decommitment, baseload generation would offer their minimum stable generation quantities at the minimum STEM price.
- The provision of LFAS is discretionary for non-Synergy generators and these generators may seek to avoid the risk of being financially exposed to the minimum STEM price. To avoid this risk, they may not participate in the LFAS market where minimum STEM price intervals are forecast. Therefore, LFAS would be scheduled by Synergy as the default

²⁴ 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 10 May 2022]. These are small generators (in terms of capacity) and are required to offer all of their output at the minimum STEM price.

²⁵ Renewable generators may choose to bid at negative prices that typically reflect the value of renewable subsidies and any contractual reasons for selling their energy in the balancing market. An example of a renewable subsidy is the large-scale generation renewable certificates administered by the Clean Energy Regulator, ([online](#)).

²⁶ AEMO's Electricity Statement of Opportunities June 2022, pg. 96, ([online](#)) [accessed 19 July 2022]

provider, and Synergy would be the only participant offering ancillary services quantities at the minimum STEM price.²⁷

- Small non-balancing active generators must offer their entire quantity at the minimum STEM price.
- Co-generation facilities may continue to offer at the minimum STEM price due to physical contractual arrangements.
- Renewable generators that offer at the floor (other than non-balancing active generators) may bid at negative prices that typically reflect the value of renewable subsidies. These offers are assumed to be above the minimum STEM price.

Using the above assumptions the ERA adjusted the composition of the price-quantity pairs offered at the minimum STEM price for the 24 low demand trading intervals to arrive at an approximation of the non-discretionary quantity that would be offered at the floor for each of the 24 intervals. This is shown in Figure 2.

Figure 2: Categories of approximated non-discretionary quantities offered at -\$1,000/MWh in the 24 low demand intervals in 2021

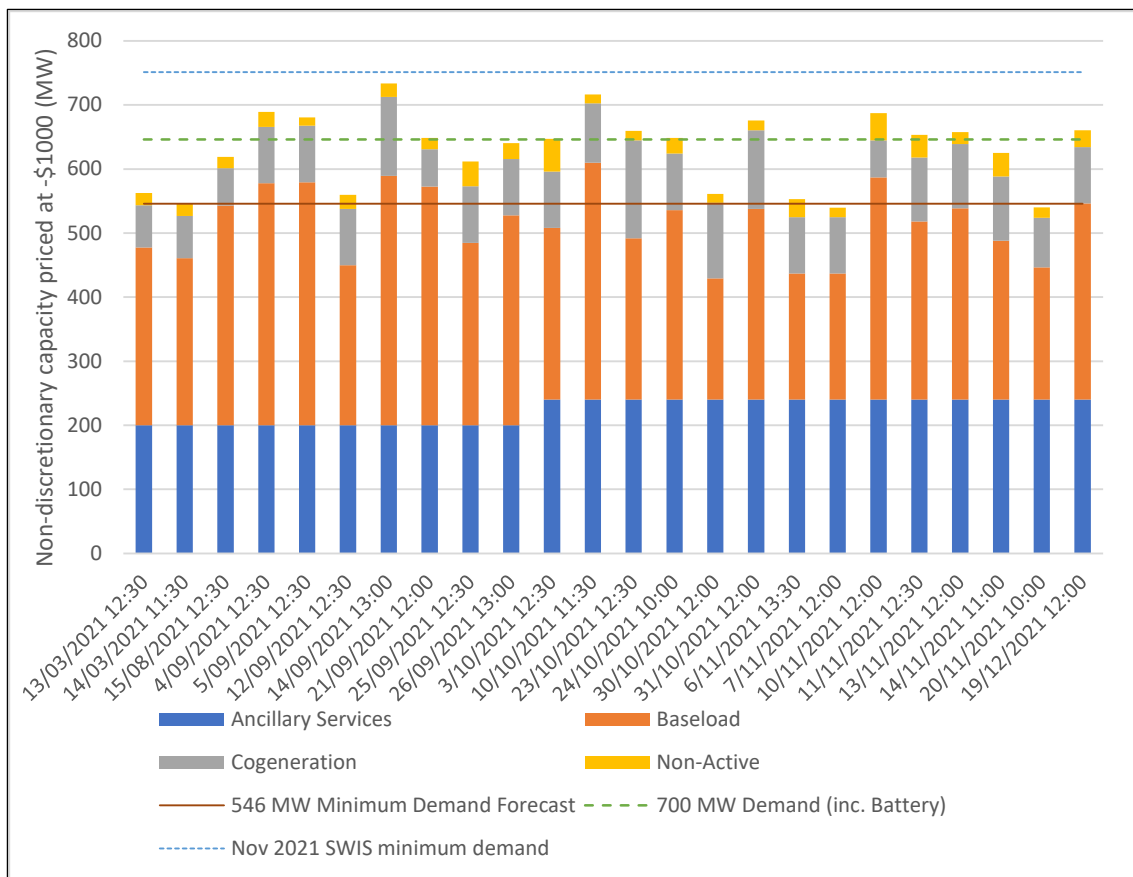


Figure 2 shows that if minimum demand reaches levels below the current record of 751 MW (blue dotted line) and down to AEMO’s ESOO forecast of close to 546 MW (brown solid line) there could be more frequent minimum STEM price trading intervals (22 intervals in Figure 2),

²⁷ The ERA assumed that Portfolio tranches flagged for the provision of ancillary services represented the minimum quantities necessary for the dispatch of these services.

in the absence of any other offsetting factors.²⁸ Two factors that are likely to mitigate the frequency of minimum STEM price trading intervals are the entrance of Synergy's new 100 MW battery storage facility and the recent change that allows AEMO to issue emergency solar management instructions to curtail rooftop PV to manage power system security in low demand conditions.

The entrance of Synergy's new 100 MW battery in late 2022 may reduce the likelihood of the balancing market settling at the minimum STEM price.²⁹ This is because a battery may find it profitable to charge during the middle of the day when electricity is generally cheaper, adding to midday demand.³⁰ Figure 2 indicates that the inclusion of a 100 MW battery that is charging may reduce the incidence of minimum price trading intervals (green dashed line).³¹

In September 2021 AEMO released the Renewable Energy Integration – SWIS Update.³² In the report, AEMO stated that around 600 MW of demand was the critical amount of demand above which the power system would remain secure under most scenarios (the November 2021 record low was 751 MW). AEMO recommended the capability to remotely constrain the level of generation from rooftop PV systems be introduced as soon as possible to assist it manage the power system when demand reaches these low levels. From 14 February 2022, all new and upgraded residential rooftop solar systems with an inverter capacity of 5 kW or less must have the capability to be remotely turned off in an emergency solar event.

In March 2022 AEMO presented the process that it would follow to constrain rooftop PV systems in these circumstances.³³ The process includes AEMO determining dynamic minimum demand thresholds and identifying periods in advance where demand is forecast to be below the threshold. This is referred to as a Minimum Demand Threshold (MDT) event. The day prior to an MDT event, AEMO will notify Western Power of the likelihood of the MDT event. Two-hours before the MDT event AEMO will instruct Western Power to maintain system load above the minimum demand threshold.³⁴ This will mitigate the risk of the balancing market settling at the minimum STEM price because the curtailment of rooftop PV in these circumstances will offset low demand.

The ERA's analysis above shows that although minimum STEM price trading intervals can occur in future, the frequency of these trading intervals is likely to be offset by the entry of Synergy's battery and AEMO's emergency solar management ability for curtailing rooftop PV.

²⁸ The analysis shown in Figure 2 is indicative only and intended to demonstrate the possibility of a minimum STEM price trading interval occurring in the current market design. The assessment is not intended to forecast with certainty the frequency that the market may settle at the minimum STEM price prior to the ERA's next review.

²⁹ Synergy, Big battery project, ([online](#)) [accessed 25 July 2022].

³⁰ For example, the ERA's modelling for its [2022/23 margin value determination](#) typically operated the battery over two charge/discharge periods per day. The first charging period is overnight and discharging during the morning ramp and the second charging period during the mid-day trough into the afternoon peak ramp.

³¹ Figure 2 is indicative only, as the extent to which the battery will offset demand will be dependent on several factors including the battery's state of charge.

³² Australian Energy Market Operator, 28 September 2021, Renewable Energy Integration - SWIS update, ([online](#)).

³³ Australian Energy Market Operator, 2 March 2022, Power System Update - Managing extreme low loads, WAECF 35 - Meeting Pack, ([online](#)).

³⁴ Rooftop PV output grew by 186 MW in quarter 2 2022- AEMO, July 2022, Quarterly Energy Dynamics Q2 2022 p.53. This provides an indication of capacity that could be curtailed in an MDT event, noting that the uptake of rooftop PV systems continues to grow. Only a portion of the 186 MW growth could be curtailed by AEMO as the emergency solar management provisions apply to systems installed or upgraded after 14 February 2022.

Minimum STEM price trading intervals that occur after the conclusion of this review will be considered in the ERA's next review of the minimum STEM price.³⁵

3.4 Stakeholder submissions

Alinta Energy stated that the current minimum STEM price of $-\$1,000/\text{MWh}$ is appropriate and does not need to change because the market did not clear at the minimum STEM price during the review period.

Synergy stated that due to increasing rooftop PV and lower system loads (lower demand) it expects that the market floor price may be reached in the near future. Due to declining minimum demand, Synergy stated that there is a risk of minimum STEM price trading intervals in the future. No minimum STEM price trading intervals have occurred since the conclusion of the ERA's 2021 review. Minimum STEM price trading intervals that occur after the conclusion of this review will be considered in the ERA's next review of the minimum STEM price.

Collgar submitted that the uptake of volatile distributed energy resources and intermittent generators will continue to increase and because of this AEMO's forecasting accuracy may decline. This could contribute to more minimum STEM price trading intervals.³⁶ This review period there have been no minimum STEM price trading intervals. This indicates that forecast information has been sufficient for generators to manage their risk of avoiding being exposed to minimum STEM price trading intervals.

3.5 Conclusion

Criterion 1 requires the ERA to determine if, since the ERA's last review, the balancing market settled at the minimum STEM price due to the minimum STEM price being too high. The balancing market has not settled at the minimum STEM price since the ERA's last review. In these circumstances, there are no trading intervals in this review period where the ERA needs to consider whether the balancing market settled at the minimum STEM price because the price was too high.

³⁵ Wholesale Electricity Market Rules (WA), 1 July 2022, Rules 6.20.14(a), ([online](#))

³⁶ In the ERA's 2021 review, submissions from 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. The ERA concluded that over-forecasting of demand was a factor for the nine trading intervals where the market settled at the floor last review. However, there were other more influential factors, including large quantities for ancillary services and commissioning tests priced at the floor.

4. Criterion 2 – AEMO’s dispatch

The ERA is required to consider the trading intervals where AEMO dispatched generators down (that is, reduced a generator’s output) 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 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) of the WEM Rules 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.^{37,38} The ERA does not need to consider trading intervals where generators were dispatched down out of merit or dispatched on or off in connection with ancillary services.

To analyse this criterion, the ERA identified whether there were any trading intervals that were forecast to settle, or settled, at the minimum STEM price during the review period. For each of these trading intervals, the ERA assessed whether AEMO dispatched a generator down below the sum of all the megawatt quantities priced at the minimum STEM price.

4.1 How may AEMO’s dispatch indicate that the minimum STEM price is too high?

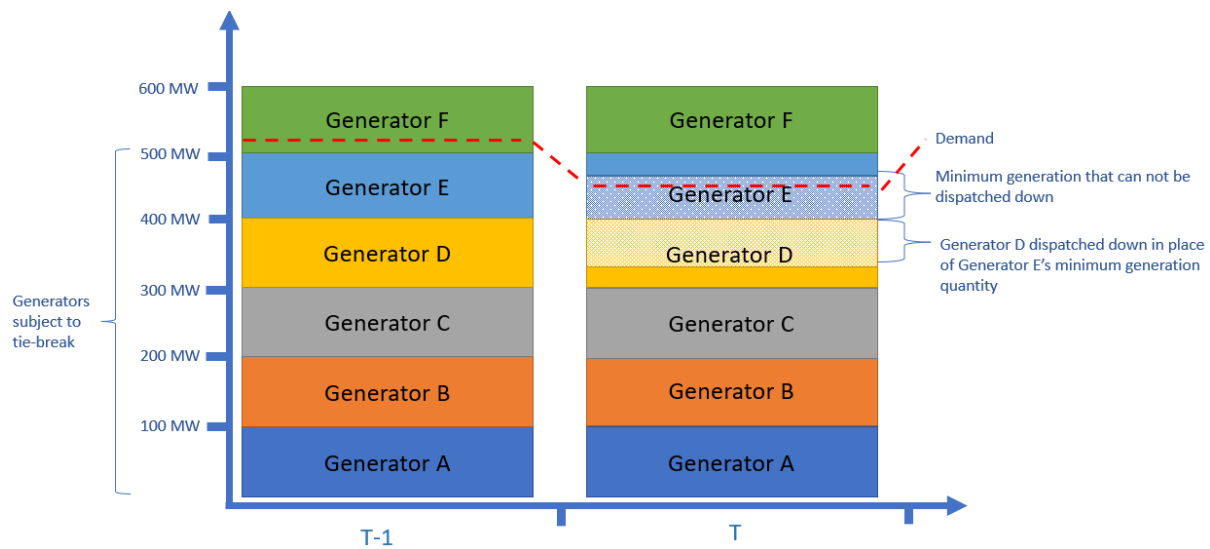
The purpose of this criterion is to consider whether AEMO intervened in the balancing market dispatch process because the minimum STEM price was too high, and the price did not allow sufficient room for generators to differentiate themselves based on their cost of decommitment. AEMO may be required to dispatch a generator down in these circumstances where there are several generators tied at the minimum STEM price but not all their quantities are required to meet the forecast demand, that is, an excess supply of electricity bid at the floor. Where there is excess supply bid 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.³⁹

Figure 3 shows how this could occur where the balancing market was forecast to settle at the minimum STEM price of -\$1,000/MWh, and there was an oversupply of electricity at that price requiring generators to be dispatched down.

³⁷ Clause 6.20.14(b) refers to the term Downwards Out of Merit dispatch. This is 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.

³⁸ AEMO can dispatch generators out of merit order to ensure system security, for example, when the SWIS is in a high-risk operating state.

³⁹ 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.

Figure 3: Example scenario where AEMO is required to dispatch a generator down

Source: Example based on ERA analysis of market data.

In the example in Figure 3, forecast demand has fallen to 450 MW from 520 MW in the prior trading interval. The tie-break process means that Generator E is the marginal generator because it has been assigned the highest tie-break number. That is, generators assigned lower tie-break numbers have a high order of preference for being dispatched on.

The 70 MW reduction in demand requires AEMO to dispatch Generator E down to 50 MW. However, Generator E is unable to reduce its output because doing so would require it to generate below its minimum stable generation quantity of 60 MW. In these circumstances, AEMO may be required to dispatch down Generator D, which has a minimum stable generation quantity of 20 MW, instead of Generator E.

The minimum STEM price may be too high in these circumstances because there was insufficient room for Generator E to offer at a lower price to ensure that it remained dispatched on, without AEMO intervening in the normal market dispatch process.

During the review period AEMO introduced a process to assist it manage dispatch during low load trading intervals in the scenario explained above. AEMO modified its dispatch process so that minimum generation quantities priced at the floor will be curtailed after the curtailment of other energy priced at the floor. However, AEMO confirmed that this modified dispatch process has not resulted in any actual interventions during the review period because there has not been any relevant forecast minimum STEM price trading intervals as discussed in section 4.2.

4.2 Observations for the review period

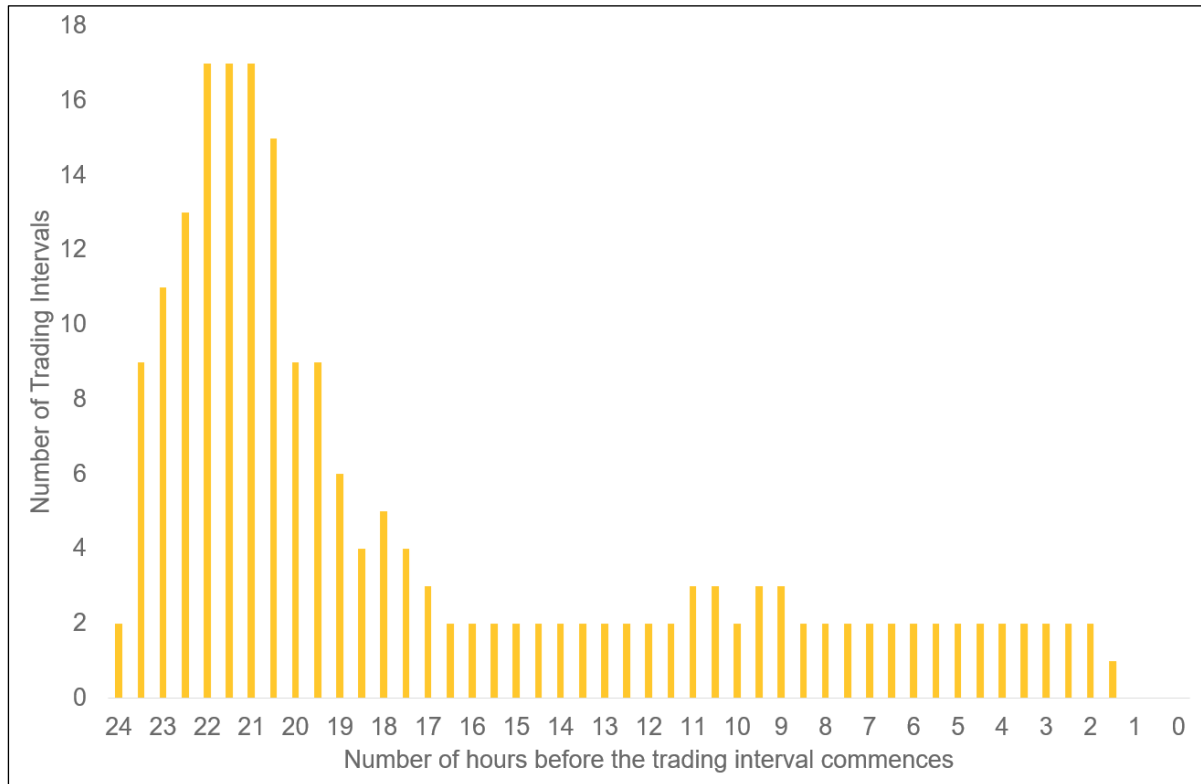
This criterion requires the ERA to consider trading intervals during the review period that were forecast to settle at the minimum STEM price. The ERA identified 206 interval forecasts where the balancing market was forecast to settle at the minimum STEM price since the last review.⁴⁰ However, these forecasts were produced up to 24 hours prior to the relevant trading interval.

⁴⁰ An interval forecast is a forecast of the price that a trading interval will settle at. The ERA's draft determination identified 202 interval forecasts where the balancing price was forecast to settle at $-\$1,000/\text{MWh}$. Four additional interval forecasts were identified up to 30 June 2022 (the end date of this review's data).

These forecasts are not relevant for this criterion because they are not the forecasts that were used by AEMO for dispatch.

Figure 4 shows the 206 interval forecasts and how many were forecast to settle at $-\$1,000/\text{MWh}$ before the start of the relevant trading interval. For example, there were two trading intervals, 23 October 2021 13:00 and 23 October 2021 13:30, that were both forecast to settle at the minimum STEM price 24 hours before the start of those trading intervals.

Figure 4: Number of interval forecasts before the start of the trading interval with a $-\$1,000/\text{MWh}$ forecast price



Source: ERA analysis of market data from 1 February 2021 to 30 June 2022.

The interval forecast that is relevant for AEMO's dispatch for a trading interval is produced approximately 30 minutes before that trading interval. As shown in Figure 4, there were no interval forecasts 30 minutes before a trading interval that forecast the balancing market to settle at the minimum STEM price for that trading interval.

There were also no trading intervals where the balancing market settled at the minimum STEM price during the review period.⁴¹ Both of these observations together, means that there were no relevant trading intervals where AEMO dispatched down a generator because the minimum STEM price was too high.

⁴¹ The ERA confirmed with AEMO that there were no trading intervals during the review period that were forecast to settle at the minimum STEM price 30 minutes prior to the start of the trading interval.

4.3 Conclusion

This criterion requires the ERA to consider trading intervals that were forecast to settle at the minimum STEM price where AEMO dispatched generators down because the minimum STEM price was too high.

There were no relevant trading intervals where the balancing market was forecast to settle at the minimum STEM price. There were also no trading intervals where the balancing market settled at the minimum STEM price. In these circumstances there were no trading intervals where AEMO dispatched down a generator priced at the floor because the minimum STEM price was too high.

5. Criterion 3 – Generator 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.⁴² The scope of this criterion is defined in clause 6.20.14(c) of the WEM Rules:

- 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, which includes new entrants, plant retirements and upgrades to, or reported deterioration of, generators.⁴³
2. Assessed whether these changes materially altered the cycling costs for the set of relevant generators such that the current minimum STEM price is no longer appropriate.^{44,45}

For the ERA's assessment of this criterion, 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.

Due to the confidentiality of cycling cost data this information cannot be published.

⁴² Wholesale Electricity Market Rules (WA), 1 July 2022, Rules 6.20.14(c) and 6.20.16(a), ([online](#))

⁴³ This also includes upcoming changes to the generation fleet over the remainder of 2022 such as retirements and additions of new generators and energy storage facilities.

⁴⁴ Cycling costs include start-up and shutdown costs, any expected losses or gains, opportunity costs and cost savings. Wholesale Electricity Market Rules (WA), 1 July 2022, Rule 6.20.19.

⁴⁵ For example, where a generator with high cycling costs have gone down but another generator with high cycling costs have gone up, the ERA's assessment considered how those generators' changing costs would affect the amount of electricity that is likely to be offered by those generators at the minimum STEM price.

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:⁴⁶

- The cost of fuel, variable operating costs, and maintenance costs.
- The time the generator takes to shut down, the 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.
- Opportunity costs that a generator would incur during these shutdown 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 offered 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. The ERA has stated that:⁴⁷

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.⁴⁸ 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.⁴⁹

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 that generator takes to shut down and restart, then during low-demand trading intervals, the generator may be willing to offer electricity at a higher price than the current minimum STEM price to reduce its financial risk. If this happens to generators with high cycling costs that offer 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 restart and shutdown costs), then the current minimum STEM price may be set too high, as generators cannot bid low enough to demonstrate how willing they are to shut down. This could lead to the balancing market settling at the minimum STEM price more often.

During this review, the ERA received updated information from some generators. The overall cycling costs of the fleet of generators decreased over the review period. However, the ERA observed that the decrease in cycling costs for generators with high cycling costs was not material because these generators continued to offer quantities at the minimum STEM price rather than at higher prices. The ERA concluded that there has not been a material change in

⁴⁶ Wholesale Electricity Market Rules (WA), 1 July 2022, Rule 6.20.19, ([online](#))

⁴⁷ The reference to 'mingen' in the quote refers to a generators minimum level of generation required for it to generate power safely and stably.

⁴⁸ 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.

⁴⁹ Economic Regulation Authority, 2008, *Portfolio Short Run Marginal Cost of Electricity Supply in Half Hour Trading Intervals – Technical Paper*, pp. 16-17.

generators' cycling costs that would indicate that the minimum STEM price is too high or too low.

5.2 Generator fleet changes

The ERA examined the generator fleet changes since the last review and changes scheduled to occur over the rest of 2022. This is discussed below.

5.2.1 *New entrants*

New entrants to the SWIS that will add generation and storage capacity are listed below:

- Kwinana energy storage (Synergy) (100 MW) – operational from late 2022.
- East Rockingham RRF Project Co – Waste to Energy (25 MW) – operational by end of 2022.
- Phoenix Kwinana Waste to Energy (33 MW) – operational in 2022.

The new entrants include 58 MW of renewable generation. As renewable generators have small marginal costs, they can offer generation quantities at the floor and displace baseload generators from dispatch. This can cause baseload generators to cycle more often which increases their wear and tear and increases their cycling costs. However, no information has been received from relevant generators that shows increased cycling costs due to the entry of more renewable energy capacity.⁵⁰ The ERA has no evidence at this time, that the new renewable generation entrants have affected baseload generator cycling costs that requires a change to the minimum STEM price.

The addition of Synergy's 100 MW battery storage facility could decrease the likelihood of the balancing market settling at the minimum STEM price. Battery storage operators are unlikely to be supplying energy at the minimum STEM price when demand is low, as storage facilities have an incentive to charge when the balancing market price is negative. Charging a storage facility adds to demand in the SWIS during low demand periods which further decreases the likelihood of the balancing market settling at the minimum STEM price.

5.2.2 *Retirements*

The following retirements of generation facilities have occurred or will occur prior to the commencement of the ERA's next review:

- Retirement of Perth Power Partnership PPP_KCP (80 MW) – disconnected on 30 November 2021.⁵¹
- Retirement of Muja unit 5 (196 MW) from 1 October 2022.

As discussed in section 3.1, generators may offer at the minimum STEM price to meet physical contractual requirements – for example, a cogeneration plant may have a physical contractual requirement to supply steam to an industrial party where steam is a by-product of the plant's electricity production. To fulfil its contractual obligations, the plant may bid at the minimum

⁵⁰ The ERA's 2021 minimum STEM price review contained similar observations following the entrance of 622 MW of renewable generation capacity in 2020.

⁵¹ Economic Regulation Authority, Exempt Transmission Connected Generating Systems, ([online](#)).

STEM price to secure dispatch to provide electricity and therefore supply steam under the contract.

The PPP_KCP facility was a co-generation plant. It is likely that its retirement has decreased the quantity of electricity available to be offered at the floor.

The retirement of Synergy's Muja 5 coal unit is scheduled for 1 October 2022. Muja 5 is one of four coal units at Muja power station with high cycling costs that offers at the market floor price. The ERA has observed that Synergy generally schedules at least one but no more than two Muja units for dispatch during low demand periods. The retirement of Muja 5 will not affect this scheduling as there are three remaining Muja units that can be dispatched to meet this scheduling requirement.⁵²

The ERA has considered whether the exit of a generator (Muja 5) with high cycling costs may mean that the minimum STEM price is too low because there could be less expensive generators that may be willing to offer electricity at a higher price than the current minimum STEM price. This is not the case because the remaining three Muja units have similar cycling costs and are likely to be scheduled for dispatch in the same manner.⁵³

5.3 Stakeholder submissions

Alinta stated that there were no material changes in the generation fleet during the review period.

5.4 Conclusion

This criterion requires the ERA to assess changes in the generation fleet and determine whether the current minimum STEM price is too high or too low.

There were no material changes in the relevant generators' cycling costs over the review period and there has not been a change in the generation fleet that indicates that the current minimum STEM price is too high or too low.

⁵² The State Government has indicated that all Muja and Collie coal power plants will be retired by 2030. This will be considered in the ERA's future reviews of the minimum STEM price - Government of Western Australia media statement, 14 June 2022, State-Owned Coal Power Stations to be Retired by 2030, ([online](#)) [accessed 14 July 2022].

⁵³ Synergy stated in its submission that "The upcoming retirement of Muja_G5 will occur on 1 October 2022 and will be the retirement of a Facility with high cycling costs. Synergy notes that similar facilities (being Muja_G6, Muja_G7 and Muja_G8) remain in its Portfolio". Synergy's submission is available on the review's website: Economic Regulation Authority, 'Minimum STEM Price Review', ([online](#)).

6. The minimum STEM price objectives

To determine whether the minimum STEM price is appropriate, the ERA must consider whether the mandatory review criteria and stakeholder submissions indicate that the minimum STEM price objectives are being met. The mandatory criteria were considered in chapters 3 to 5. The minimum STEM price objectives and stakeholder submissions are considered in this chapter.

The objectives of the minimum STEM price are:

- 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.

The ERA received submissions from three stakeholders during the February 2022 consultation period. Submissions from Synergy and Collgar stated that the current minimum STEM price is low, and a higher minimum STEM price would better meet the minimum STEM price objectives. However, Alinta Energy's submission suggested that the current minimum STEM price is appropriate and does not need to change.

Submissions received from Alinta Energy and Shell Energy in response to the ERA's draft determination consultation period supported the ERA's findings that the current minimum STEM price is appropriate. Synergy stated that it understood the ERA's draft decision to not amend the current minimum STEM price but maintained its view for a higher minimum STEM price.

The ERA has considered these stakeholder views in this chapter when assessing whether the current minimum STEM price is meeting the clause 6.20.16 objectives.

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

The first objective of the minimum STEM price is to allow the balancing market to clear above the minimum STEM price in most circumstances (clause 6.20.16(a)). If the balancing price is settling at the minimum STEM price often, then the minimum STEM price is not meeting this objective.

The balancing market did not settle at the minimum STEM price during the review period. The balancing market has only settled at the minimum STEM price nine times since the market commenced in 2012. The rarity of minimum STEM price trading intervals indicates that the minimum STEM price is meeting the objective to allow the balancing market to clear above the minimum STEM price.

While Collgar and Alinta agreed that the minimum STEM price is meeting the first objective, Synergy stated that the minimum STEM price is too low and does not meet the objectives under clause 6.20.16 of the WEM Rules. Synergy raised similar concerns in the 2021 minimum STEM price review and suggested that a higher value of -\$250/MWh was more appropriate.

In its 2021 review, the ERA concluded that 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 ERA has updated its 2021 analysis of the possible market outcomes of a higher minimum STEM price of -\$250/MWh. The ERA finds that at -\$250/MWh, the balancing market would likely settle more often than at the current price. The ERA's analysis indicates that the balancing market would have likely settled at a -\$250/MWh floor price 269 times since the last review. This would not be consistent with the objective for the balancing market to settle above the minimum STEM price in most circumstances.

The details of the ERA's analysis on the proposed minimum price of -\$250/MWh is in Appendix 2.

6.2 Clause 6.20.16(b) – exposure to a minimum STEM price that threatens a participant's financial viability

The second objective of the minimum STEM price is to limit the exposure of market participants to balancing prices that would threaten their financial viability.⁵⁴

Synergy stated that the minimum STEM price is too low and creates unnecessary risk that has the potential to threaten the financial viability of prudent market participants.⁵⁵ Synergy has raised this issue in consecutive minimum STEM price reviews. Synergy's concern is that generators that provide ancillary services must offer their ancillary services quantities at the minimum STEM price and may face financial risk if the market settles at the floor.⁵⁶

Generally, generators that choose to bid their energy at the minimum STEM price would consider the financial exposure risk of the market settling at the floor price. However, under the current market design, generators that provide ancillary services must bid these quantities at the minimum STEM price and may be exposed to the financial risk of the market settling at the floor. The ERA acknowledges that Synergy is the default provider of ancillary services and since it must offer these quantities at the floor price, it faces the risk of being exposed to the minimum STEM price.⁵⁷ Synergy's proposed higher minimum STEM price will not resolve this issue as the financial exposure risk still exists even if the minimum STEM price is higher.

Addressing Synergy's concerns requires changes to the current market design. This is outside this review's scope and the ERA is therefore unable to consider Synergy's concerns further as part of this review. However, the current market design will be changing in the near future. The introduction of co-optimised energy and ancillary services markets as part of the new market design in October 2023 will resolve Synergy's concerns. In the new market design, Synergy will not be the default provider of ancillary services and ancillary services providers will not have to bid at the floor price. Further, the risk of financial exposure to the minimum

⁵⁴ 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.

⁵⁵ Collgar also stated that the current minimum STEM price may be too low for LFAS generators that are required to offer at the floor price as it may expose these generators to financial risk.

⁵⁶ Synergy also stated that it offers quantities at the minimum STEM price to avoid infeasible dispatch instructions. Infeasible dispatch is where a generator is dispatched below its minimum stable generating level.

⁵⁷ Generators other than Synergy may choose to participate in the provision of ancillary services.

STEM price prior to the start of the new market design is low as it is unlikely that the balancing market will settle frequently at the minimum STEM price as discussed below.

The ERA's analysis in section 3.3 indicates that declining minimum demand may lead to the balancing market settling at the minimum STEM price in the future. Sustained exposure to the balancing market settling at the minimum STEM price may increase the financial exposure risk of a generator (assuming that the generator has no offsets or hedges). However, the analysis in section 3.3 indicates that there are factors that will materially reduce the risk of minimum STEM price trading intervals occurring frequently and therefore mitigate the possibility of a market participant being exposed to the extent that it threatens their financial viability. These factors include the entrance of new battery technology (Synergy's 100 MW battery) and AEMO's ability to issue instructions to curtail rooftop PV, that will offset demand.

These offsetting factors mean that in the period between now and the commencement of the new market design in October 2023, it is unlikely that the balancing market will settle frequently at the minimum STEM price. The ERA's minimum STEM price reviews following the commencement of the new market design in October 2023 will need to assess whether the minimum STEM price objectives in clause 6.20.16 of the WEM Rules are still being met.

6.3 Conclusion

The current minimum STEM price meets the clause 6.20.16 objectives. The current minimum STEM price has allowed the balancing market to settle above it since the last review, and this is likely to continue leading up to the next review. Further, 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.

7. Other matters raised by stakeholders

Collgar's submission raised matters relevant to the new market design scheduled to commence in October 2023, such as:

- Whether the frequency of minimum STEM price intervals will increase due to changing market dynamics.
- Whether market participants may be materially exposed to the minimum STEM price as the market clearing price for a 30-minute trading interval will be calculated as the average of the price for each six dispatch intervals (five minutes each) making up that trading interval. This could mean that a market participant that was not generating in a minimum STEM price dispatch interval may still be affected by the floor price if it was generating in later dispatch intervals.

These matters will need to be considered in the ERA's future reviews.

Collgar also submitted that the ERA may need to amend or add to the minimum STEM price objectives to reflect any new market power mitigation arrangements and suggested that the ERA liaise with Energy Policy WA on these arrangements.⁵⁸

The process for conducting the minimum STEM price review, including the objectives of the minimum STEM price, are specified in the WEM Rules. Following last year's review, the ERA discussed the review process with Energy Policy WA, including the possibility of incorporating the review into more holistic periodic review process for all energy price limits. The ERA understands from Energy Policy WA's proposal in its Market Power Mitigation consultation paper that the review of the minimum STEM price is to be conducted every three years rather than annually under the current rules.⁵⁹

⁵⁸ Collgar's submission indicated that this is relevant because the future participation of energy storage facilities in the WEM means that the minimum STEM price will become the price cap for storage facilities charging from the network.

⁵⁹ Market Power Mitigation Strategy, 1 August 2022, Consultation Paper, ([online](#)).

8. ERA's final determination

The ERA's final determination is that the minimum STEM price is appropriate at its current level of $-\$1,000/\text{MWh}$. In the context of this review, "appropriate" 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.⁶⁰

To form this final 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.

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

- The balancing market has not settled at the minimum STEM price since the ERA's last review. In these circumstances, there are no trading intervals where the ERA needs to consider whether the balancing market settled 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 relevant generator cycling costs since the last review and there has not been a change in the generation fleet that indicates that the current minimum STEM price is too high or too low.

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. 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.

The ERA's determination means that the minimum STEM price will remain at $-\$1,000/\text{MWh}$.

⁶⁰ 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.

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Appendix 2 Analysis of a higher minimum STEM price

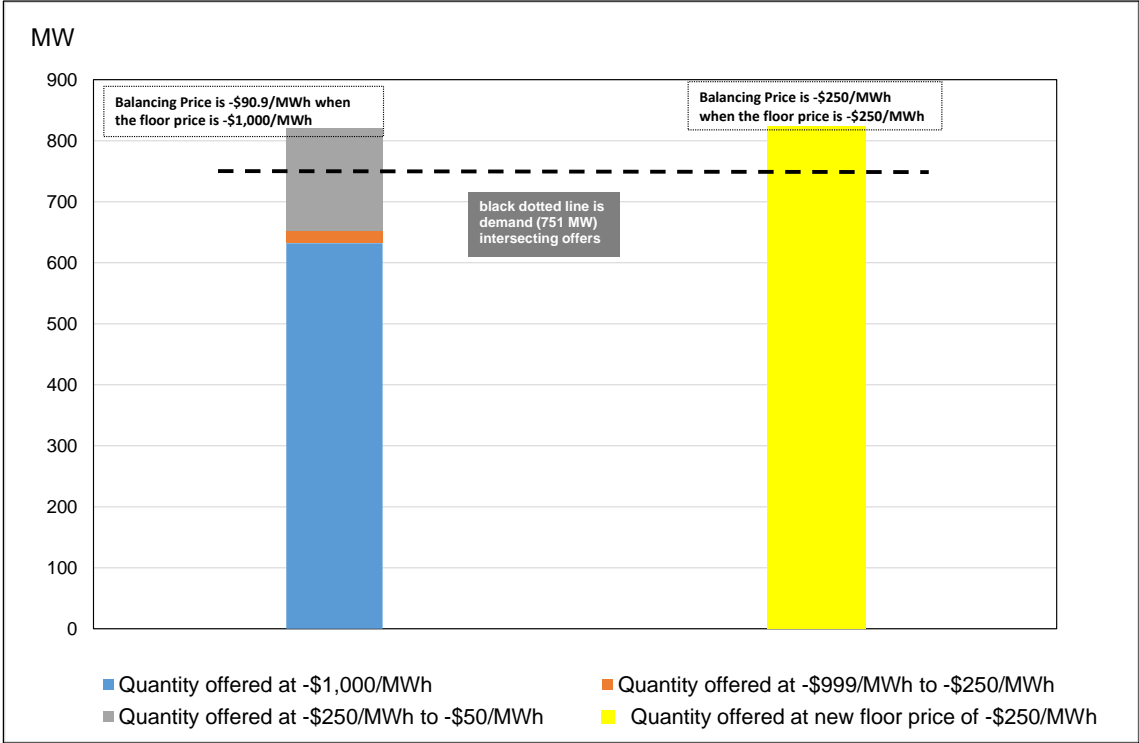
Similar to the 2021 review, Collgar and Synergy have suggested that a higher minimum STEM price of $-\$250/\text{MWh}$ may be more appropriate. To consider these submissions, the ERA updated its 2021 analysis on the implications of setting the minimum STEM price at $-\$250/\text{MWh}$, albeit the ERA cannot set the minimum STEM price at a level of its choosing but must follow the process in the WEM Rules to determine a new price.

The ERA's analysis assessed trading intervals during the review period (1 February 2021 to 30 June 2022) with assumptions to account for possible changes to participants bidding behaviour. The ERA's analysis for the review period assessed whether the balancing market, when accounting for behavioural changes, would have settled at a higher $-\$250/\text{MWh}$ minimum STEM price during the review period. The assumptions of this analysis were (see Figure 5):

- Generators that currently offer quantities at the minimum STEM price of $-\$1,000/\text{MWh}$ would offer their quantities at a higher floor price of $-\$250/\text{MWh}$.
- Generators offering quantities between $-\$999/\text{MWh}$ and $-\$250/\text{MWh}$ would offer their quantities at the higher floor price of $-\$250/\text{MWh}$.
- Generators that currently offer quantities between $-\$249/\text{MWh}$ and $-\$50/\text{MWh}$ may decide to offer their quantities at the higher floor price of $-\$250/\text{MWh}$. The ERA considered that this could occur for those generators that in the past, have bid at $-\$1,000/\text{MWh}$ (for example, on low demand days some generators have moved their bids to $-\$1,000/\text{MWh}$ to maintain or increase their priority for being dispatched).

Based on these assumptions, the analysis shows that the balancing market would have settled at the higher $-\$250/\text{MWh}$ minimum STEM price 269 times in the review period. The balancing market has not settled at the current minimum STEM price of $-\$1,000/\text{MWh}$ since the last review. The outcome from the analysis is not consistent with the minimum STEM price objective of allowing the balancing price to clear above the minimum STEM price in most circumstances.

Figure 5: Scenario analysis between floor prices of -\$250/MWh and -\$1,000/MWh



Source: Example based on ERA analysis of market data.